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VOL. XI. NEW YORK, JAN. 21, 1888. No. 3.

Patent Reform. THE diversity of opinion that prevails on patent law reform is well illustrated by the very able and thoughtful article from Mr. E. C. Davidson in our columns this week. Mr. Davidson is of those who deprecate present agitation of the subject in Congress, and he sums up the objections in a masterly manner. As one whose position entitles him to the fullest attention, his article will be read with care and, even should it not convince, it will have its effect in preventing precipitate action.

A Broken Incandescent Lamp. THE incandescent lamp "freak" which we illustrate on another page, will no doubt awaken in the minds of our readers thoughts regarding the origin of the formation of the lamp fracture. Our correspondent, Mr. Blodgett, has given his neat theory regarding the manner in which the break may have occurred, but we have no doubt that others will seek another cause, in which the breaking of the filament itself may have been the prime factor in the destruction of the lamp. Thus we may assume that the breaking of the filament produced an arc which, after becoming longer and longer, finally heated up the glass of the surrounding globe sufficiently to cause the outer pressure of the air to indent and perforate it as shown in the engraving.

Mr. David Brooks on Underground Conductors. JUDGING from the verve and freshness with which Mr. David Brooks presents his own case as to underground conductors on another page, one would take him to be a young and brilliant electrical engineer of the new school. It is hard to believe that his experience with electrical conductors extends over half a century, but such is the fact; and as the result of what he has learned, he is ready today with improvements and new ideas. What Mr. Brooks has to say for himself—said in his own graphic way—our readers should not fail to ascertain.

The Case Batteries. THE discussion on the battery brought out by Mr. Willard E. Case before the American Institute of Electrical Engineers goes to show that although little has been heard of work in the direction of obtaining electricity from carbon or coal, not a few have been silently plodding their way along in this field, and have obtained results of more or less promise. The several examples of such work brought forward during the discussion led to the valid conclusion arrived at by one of the speakers, that in order to be economical any process involved in the generation of electricity from the oxidation of coal must draw upon the atmosphere for its oxygen. Though, as was shown, a number of manufactured products are adapted to the purpose, their cost is such as to make any practical solution of the problem by their use out of the question. The very reserve maintained on the general subject by experimenters is an indication that efforts are not being relaxed.

Fire Department Figures. THE Fire Department returns for this city for 1887 show 2,912 actual fires. Of these only 22 are attributed to electricity, while gas explosions count up 50; gas-lights, etc., 254; kerosene lamps 474, and matches, tapers, etc., 626; and naphtha, benzine and gasoline vapor have exactly the same score as electricity. It may be mere prejudice on our part, but we regard these figures as a very good exemplification of the superiority of the electric light where safety is concerned. It would not be amiss to have these statistics supplemented by the number of injuries and deaths from gas, including the cases of suicide. Some day, perhaps, we may have lists of suicides from electricity, but it is doubtful, as the average person does not care for a death too horrible, or for one which has such an element of awful uncertainty in it. A point in favor of the electric motor, by the way, is the large number of fires due to boilers, foul chimneys and flues, machinery friction, steam pipes, etc., none of the perils of which accompany that useful form of apparatus.

A Monster Electro-Magnet. PROBABLY Major King may rightfully boast of having the largest artificial magnet ever made, and its power no doubt is extraordinary. The experiments which he made evidence the enormous portative force of such forms of magnet, but it is to be regretted that Major King did not continue his experiments so as to obtain absolute values in his magnetic measurements which would have given the number of lines of force emanating from the cannon magnets. We would then have been able to form some idea of the relative efficiency of large and small magnets with regard to the energizing current. It would also have been interesting to have been told of the effects of filling up the bore of the cannon and thus obtaining the relative strength of the field and portative force of solid and hollow magnets. Perhaps Major King may still see his way open to continue his very interesting experiments in this line, and we hope he will be able to add something to the information already extant on the subject of magnetism. With the aid of the enormous magnets at his command he can answer a variety of questions.

Execution by Electricity. WE have already commented on the intention of the special commission appointed by the New York Legislature, on methods of execution to report in favor of electricity; and as we go to press the announcement is made that the Commission has sent in the expected document. Expressions of opinions were invited from Supreme Court judges, county judges, district attorneys and sheriffs, and they were largely in support of the abolition of hanging and the substitution of electricity as the lethal agent. The report embodies also a mass of historical information, and is supplemented by scientific statements and the suggestions of Mr. Edison, Prof. Elihu Thomson and others, whose utterances have weight and authority. The recommendations of the Commission are in accord with the public sentiment on this painful subject, as given voice to in the article by Mr. W. D. Howells, which we print elsewhere here. This method of execution is a tremendous realization of the old notion that Jove struck the guilty with his sudden thunderbolts, and must, we think, whether it be ruled that the punishment shall be inflicted when the criminal is awake or when he is asleep, serve as a great deterrent from crime.

Automatic Telegraph Systems. WHILE we often see note of telegraphic bulls, there can be no doubt that by far the greater number never are heard of beyond the parties interested therein personally. These mistakes are for the most part due to the number of times the message is repeated or retransmitted by different operators. The present system of telegraphy is not only open to the liability of errors of transmission and reception, but it also requires a skilled operator at each station. If, therefore, there were an instrument which should record the message transmitted by the first operator, and this record itself be the transmitting medium for any further repetitions, not only would the liability to error be diminished, but the cost would also be greatly decreased, because this record could be conveyed through the machine at a comparatively rapid rate. This idea, as our readers well know, is embodied to a certain extent in the Wheatstone automatic system of telegraphy by which a very high rate of speed has already been attained, but this system requires the message that is to be forwarded to be first prepared by the perforation by hand of a transmitting slip. In the instrument illustrated and described on another page, the perforation of the tape is accomplished by the receiving instrument automatically and thus all manual preparation for re-transmission is avoided. As also suggested, the retardation due to long lines can be gotten over by the relaying of a message so recorded, which can be sent through at an accelerated rate of speed.

Alternating Current or Storage Battery? IN the comparison which Dr. Duncan institutes between the systems of electrical distribution now in vogue or proposed, he seeks to show that while under some conditions the alternating method of distribution is more economical than the ordinary low tension direct system, yet even these advantages may disappear when the storage battery shall have been brought to a higher state of perfection. Dr. Duncan correctly assumes that a station or system to work with the greatest economy must be operating at its maximum capacity for the greater part of the time. By means of storage batteries, in connection with a central station, the generating plant can be made smaller, and can be operated continuously, feeding either directly into the lighting circuits or charging the batteries for subsequent use. And, again, by arranging storage battery sub-stations, in which the batteries are charged by a high potential current from the main station and distributed at a low potential, all the advantages of the alternating system are obtained without its disadvantages, such as they may be. This idea of utilizing the storage batteries as distributors and as a medium to maintain the continuous economical operation of a central station is not a new one, but the argument put forward by Dr. Duncan once more loses none of its force by able restatement. Evidently the question, as he puts it, is one mainly of the durability of the storage battery, for there stands nothing in the way of the system of distribution, such as he has pointed out, in which storage batteries occupy the position of transformers to reduced the high potential of a central station to the low potential required for house to house distribution. It will be an odd revenge of time if the decried storage battery thus comes to be a main reliance of direct current systems.

Report of the Board of Electrical Control. THE first report of the New York Board of Electrical Control, the successor of the old Subway Commission, shows that distinct advances have been made toward the end for which that body was created. Looking at the results thus far accomplished and at the reasons which have dictated the general policy carried out, it must be frankly admitted that the Board has in the main followed the dictates of common sense. It has, for example, not set out to provide or compel the adoption of an insulating conduit *per se*, as was, we believe, contemplated at one time. It has, in fact, provided nothing more than a conduit which shall be a mechanical protection for the wires within it, and has treated the question of insulation as that of each individual wire or cable, to be determined by the owner, subject to suitable regulations. The adoption of the latter course was a natural consequence of the former, and relieves the Board of considerable responsibility. The methods adopted for the construction of the conduits for various purposes, as illustrated last week, show that the problem of local distribution is one also left largely to the choice of the electrical companies themselves. But we have little hesitation in saying that in the large majority of cases the house-top local distribution will be mostly availed of by the companies operating the wires. The Board states in its report that New York at present has a greater mileage of wire underground than any other city in the world; but even this so far accomplished is but one step in a work which will probably require years to complete. It must also not be forgotten that the subways as now being built will have to undergo the test of time, and that some modifications may suggest themselves by difficulties which cannot now be foreseen. In view of the circumstances that have attended its formation and procedure as a body subject to political influences, the Board has done much better than we thought it would. It has aroused expectations on the part of the public that it cannot afford to disappoint, and it has discovered that, as we have so often maintained, it will find its best supporters and allies in the various electrical companies, so long as nothing unfair or unreasonable or impossible is demanded.

NEW BOOKS.

PHENOMENA OF RETARDATION IN THE INDUCTION COIL. By Wm. Stanley, Jr. Transactions of the American Institute of Electrical Engineers, No. 4, Vol. 5. Published by the Institute, New York, 1888. 56 pp.

This, the latest monthly issue of the transactions of the Institute, contains Mr. Stanley's valuable paper on the induction coil as now used in the alternating system. It will be remembered that this paper was at the time of its delivery in December published, with a report of the discussion, in all the journals. In the present form both paper and discussion have been carefully revised and illustrated by a large number of new diagrams, making no fewer than 22 in all. The pamphlet contains also an interesting communication from Mr. E. W. Rice, Jr., in regard to certain work and experiments carried out by Prof. Elihu Thomson. Altogether, this is one of the most valuable contributions that we have seen to the literature of that extremely important subject—alternating currents. The number contains also another installment of the useful index of current electrical publications, now being regularly compiled by the Institute. This part, we note, covers the papers for November, and includes references to over 350 articles printed during that month. Supplementing this is a list of the principal authorities cited, giving details as to their date of issue, price, etc. In more ways than one the issue may be regarded as a striking proof of the high standard already attained by electrical engineering in America, and it is a great pleasure to us to find the Institute doing so much that is worthy of commendation, as well as—evidenced by Secretary Pope's prefaced bulletin—largely increasing its membership from month to month and enlarging its sphere of activity and influence. Membership in it is an honor to be sought and prized, and, as Mr. Pope quotes: "Every man is a debtor to his profession, from the which, as men do of course seek to receive countenance and profit, so ought they of duty to endeavor themselves, by way of amends, to be a help thereunto."

MEMOIR OF FLEEMING JENKIN. By Robert Louis Stevenson, New York. Charles Scribner's Sons. 302 pp., 5 x 7¼. Price $1.

It is a pity that biographical writing so very often has an effect contrary to that intended or ustified. The author, full of enthusiasm for his hero, plunges into a mass of detail that tires the reader, or into reckless eulogy that simply disgusts. Even this is perhaps better than no biography at all, but it is easy to believe that the subjects of this inartistic treatment would have preferred to sink into oblivion or would wish they had never been born. It may be harsh to say, but one ought not to be a hero to his biographer.

Let us remark here, however, that this memoir has the right character. The style is delightful, of course. Mr. Stevenson has written no page without a charm of manner peculiarly his own, and even now when limitations of fact check his ranging fancy, they cannot deprive him of his lightness of touch, felicity of phrase and grace of diction. There is little of scientific value in the book. Professor Jenkin's really great invention of telpherage is dismissed in half a dozen lines and without a word of explanation. His work in early ocean telegraphy is dimly seen in these pages, and of his important achievements in standardization of electrical units, there is but casual mention, except in the appendix, quoted from his friend, Sir William Thomson. But we have before us a man in whom the red blood runs, a man quick to speak and quicker to do, a man to whom electrical science owes much, for as here described by himself, he found the study of electricity so entertaining that he was apt to neglect his other occupations. "Yesterday I had some charming electrical experiments. What shall I compare them to—a new song? A Greek play?" This same passion for experiment, so noticeable in Faraday and commented on in Tyndall's life of the philosopher, came out in other things and all through his career. "In 1878 he took a passionate fancy for the phonograph; it was a toy after his heart, a toy that touched the skirts of life, art and science, a toy prolific of problems and theories." So eager was he to study the new invention that he could not wait until one of Mr. Edison's machines had crossed the sea, but built two with his own hands, after a description in the newspapers.

We are glad to have this biography. It has in it the stimulus of Carlyle's "John Sterling," though pitched in a different key. It has the same advantage of nearness and intimacy that characterizes the life of Louis Agassiz by his wife; and for all such writing that adds to the gallery of true men, gratitude is due.

Current Distribution of the Near Future.

BY DR. LOUIS DUNCAN, JOHNS HOPKINS UNIVERSITY.

Outside of constant current systems, which may for the present be considered as occupying a permanent field apart from the others, the two rival systems of electrical distribution are the direct and alternating constant potential systems; the former using direct currents of low potential, the latter employing alternating currents of high potential, reduced to a lower potential at the points of consumption.

I have, on a former occasion, considered the efficiency of direct current generators under different conditions, and before taking up alternating current apparatus, I will consider briefly the relative value of the two systems.

For lighting alone, leaving out the possibility of the use of storage batteries, and considering solely the economy of distribution, the alternating system presents a number of advantages where we wish to supply an extended area with light. These advantages are well known. In the first place, the flexibility of the system is greater; and, in the second place, the cost of conductors is very much less. It is in this last item that the system possesses the greatest advantage, and it would seem that it is undoubtedly better than either the parallel or multiple series systems for lighting extended areas, where the lights are more or less scattered.

There are two comparative disadvantages, however, in the system. No alternating current motor has yet been invented that will work practically, and even, provided storage batteries are improved so as to allow of their extended use, the system cannot economically profit by the storage of electricity. As to the first disadvantage, I think that it will, in time, be overcome. The problem is a perfectly definite one, as there are no underlying impossibilities in the working of such a motor, and I have strong hopes that in the next year or so alternating current motors will be working as successfully and economically as continuous current motors are to-day.

But if I believe in the future of alternating motors; I also believe in the future of storage batteries; and when these can be economically used, the greatest comparative advantages of the alternating system are lost. The flexibility of the direct system will then be as great as that of its rival, while it will gain the great advantage of storage, allowing a station to supply two or three times the energy with no increase of plant or complexity excepting that due to the battery itself.

STRANGE COLLAPSE OE AN INCANDESCENT LAMP.

The plan to be adopted would doubtless be to establish sub-stations containing the batteries and regulating apparatus, each of these stations supplying an area determined by the circumstances of the case, with an attendant in charge of one or more such stations. Such a system would allow all the uses to which electricity can be applied and under simple and favorable conditions.

Even under present conditions, if the company manufacturing the distributing apparatus had the right to manufacture storage cells and supply them at a slight advance over cost price, and afterward renew them when necessary, I believe the storage system could be economically applied in some cases. For example, the 1 h. p. cell of a well known company probably costs something like $7 to make, taking lead at 5c. per pound, and red lead and litharge at 6. For renewal we should allow, perhaps, one complete set of positive plates and 15 per cent. depreciation on the rest of the cell. This, subtracting the value of the old positives, would give not over $2.50 a year for depreciation. If we take these figures we could, I think, work out a profit in some cases. It is the best that can be claimed for storage at present, unless I have overestimated the repairs. It is needless to say, however, that these prices are not those which rule in the market at present.

I have seen lately, in an English journal, an article by Mr. Rankin Kennedy, in which he wishes to show that the alternating system would profit by the success of the storage battery. He proposes to have the cells at the central station, to charge them during the day, and, when extra power is required, to use them to drive the motor of a motor-alternating-dynamo apparatus which will feed into the main lines. I fail to see any particular advantage offered by this plan; certainly no advantage comparable with that obtained by the direct system.

The advantage of storage batteries used in connection with a system of distribution, apart from any increase in the facilities for distribution, is this: It allows the plant to be utilized the entire twenty-four hours of the day, instead of only a part of that period. Now the plan of Mr. Kennedy certainly does allow a part of the original plant to work the whole time, namely, the engines and boilers; but the dynamos are idle, and the investment has been increased by the purchase of the motor-dynamo, *i. e.*, the machines he proposes to use. Of course, the motor part of the new arrangement can be used to charge the batteries. However, this fact remains, that the capacity of the station is never greater than that of the dynamos that are running. It is a question of economy whether the increased number of dynamos shall be driven by increasing the steam plant or letting the steam plant remain the same, by purchasing a storage battery and motors equal to the additional power required, and wasting afterwards the energy lost in the three conversions necessary, a constant loss of 30 or 40 per cent. (supposing the battery has 80 per cent. efficiency). I think that in most cases it would be preferable to enlarge the steam plant.

I do not know what the arrangement of converters would be in the alternating system in cases where the wires were necessarily underground. I suppose the primaries and secondaries would be connected as in the overhead lines, a number of the latter to the same circuit. This arrangement is, of course, greatly preferable to using a single converter for each house, since in the latter case the converter would have to be of the maximum capacity needed, while the average energy taken from it for a month would not be more than, say, one-twentieth of this. Using a single circuit for a number of houses partly obviates this, although I might show that the average efficiency of such a system for the twenty-four hours is considerably less than the maximum efficiency of any converter.

To sum up briefly the views given above of the relative values of the alternating and direct systems of distribution, I think that at present the latter has many advantages in densely populated areas, especially if power can be distributed as well as light; while the former is in a better position to distribute light where the population is more scattered. But it is very evident that a combination of the two systems would be vastly better than either alone, in almost any supposable case.

Indeed, when one considers the great advantage that a local lighting company utilizing any system or any part of a system it might need would have over companies, as most of them are at present, using only one system and only able to do one kind of work, it encourages us to think that even if no new discoveries were made, but those we have already were properly combined, the cost of domestic lighting by electricity would be less than that of gas.

An Incandescent Lamp "Freak."

BY G. W. BLODGETT.

The accompanying incandescent electric lamp, with a fracture of the globe and filament, presents somewhat curious and interesting features. Several Bernstein lamps are run from the circuit of a Brush 16-light machine (lamps of 2,000 c. p.) belonging to the Boston & Albany Railroad Company. These Bernstein lamps are of 32 c. p. nominal, and are operated in series multiple—two in series and two in parallel. An automatic cut-off in a small iron box introduces a resistance in case any lamp fails, and thus protects its mate from like interruption or destruction.

The lamp was found in its present condition by the man who has charge of the circuits, and I do not know that any one observed it at the actual moment when the fracture took place. The globe, as will be seen, has on one side a funnel-shaped depression more than an inch in diameter at the mouth, with a hole in the bottom about a quarter of an inch in diameter. It will be seen, moreover, that nearly half of the filament is destroyed immediately opposite the depression or opening. The blackening of the interior of the globe would lead one to infer that the filament had been largely converted into dust and deposited on the glass.

A study of the peculiar appearance of this lamp indicates to me that it was broken in the following manner: The glass was thinner on the affected side of the globe than on the other, and became slightly softened by the heat from the filament. It then yielded to the pressure of the air from the outside, so that a slight hollow began to form on that side. The glass now became still thinner and hotter at this weak point, and yielded more and more until broken by the exterior pressure. Then and not before the filament was instantly destroyed. I shall be glad if any of the readers of THE ELECTRICAL WORLD can throw further light on this theory and confirm it, or present one more probably correct.

Motors in Printing.—The electric motor whose successful operation in the Richmond (Va.) *Times* office has attracted so much attention in the South is fittingly a Baxter—made in the South.

An Electro-Magnet Made of Two Cannons.

Some very interesting experiments have been recently made at Willet's Point, New York Harbor, by Major W. R. King, U. S. Engineers, and we illustrate them on this page. We are indebted to Major King for the photographs and the details below.

The appropriate name of Jumbo has been given to the apparatus, Fig. 1. The magnet was improvised by coiling insulated wire around two 15-inch guns that had been placed near and parallel to each other for the purpose.

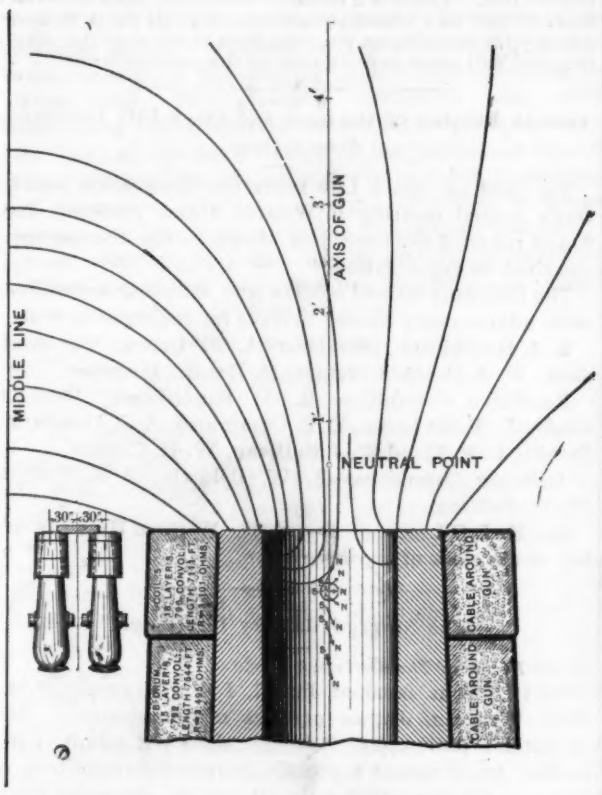


FIG. 2.—DIAGRAM OF LINES OF FORCE.

The wire was in six coils, three on each gun, and extended back about six feet from the face of the muzzle. The entire length of wire was about eight miles, and it had a core of twenty No. 20 copper wires, and seven smaller wires, all bundled together at the ends, and covered with rubber, tape, etc., making a cable four-tenths of an inch in diameter, with a resistance of about 2.4 ohms per mile. Each coil was 26 inches in diameter inside, 40 inches outside, and 24 inches long, these figures being average dimensions.

The two guns, which formed the core of the magnet, weigh 50,000 pounds each, and were connected at the breech by a pile of railway bars, etc., making a cross section of some sixty square inches, not nearly as large, however, as it should have been to give the best results. The armature was also much too light, and was made of of ½-inch plates, each 11 inches wide, thus giving a cross-section 7½ inches by 11 inches. The current was furnished by a dynamo that operates twenty arc lights.

The following experiments were tried with this arrangement:

1. Several trials of the attractive power of the magnet were made. A pull of five tons at the middle of the armature failed to detach it, and as this was the limit of the power of the Duckham dynamometer the chain was attached to one end of the armature. A pull on this chain, equivalent to a strain of 20,600 pounds at the centre of the armature, was required to remove the armature.

2. Four 15-inch shells, each weighing 320 pounds, were suspended in a vertical line from one of the guns, and there appeared to be considerable surplus magnetism at the lower end of the line, though not enough to sustain another shell.

3. By holding a spike or a bit of wire in the hand, the lines of force were distinctly felt even five or six feet distant from the poles, and these lines were marked on a large sheet of paper, Fig. 2.

4. A neutral point was found in the axis of the bore of the guns prolonged, seven and a half inches in front of the face of the muzzle, and a small piece of iron placed at this point was neither attracted nor repelled. At either side of this point or beyond there was a powerful attraction, while between it and the gun there was a strong repulsion.

5. This repulsion was tested by placing small pieces of soft iron wire in the axis of the gun, and letting them shoot out through a tube and on a smooth piece of board. These little projectiles were about one-tenth of an inch in diameter and three inches long, and were thrown out about two feet from the gun and then suddenly drawn back to it, where they, of course, attached themselves, and remained sticking out like the quills of a porcupine. Larger masses of iron are pushed out with greater force, though they would not be projected as far on account of their extending into the lines of attractive force on either side of the axis.

Observations on Atmospheric Electricity.*

BY PROF. L. WEBER.

I will try to give a short report of some experiments I have made during the last year in regard to atmospheric electricity. It was formerly uncertain whether the electrostatic potential would increase by rising from the surface of the earth to more elevated regions of the atmosphere or not, and also whether the potential in a normal —that is, cloudless—state of the atmosphere was always positive or sometimes negative. Sir Wm. Thomson found by exact methods of measuring that the increase of the potential with elevation is very important, and amounts to about 100 volts per metre. That fact is proved by many other observers, especially lately by Dr. F. Exner at Vienna, who found an increase of 60 to 600 volts per metre. These observations were made by means of an electrometer. In respect of many inconveniences which are connected with tne use of an electrometer, I have tried the measurements with a very sensitive galvanometer. In this case it is necessary to apply a separating air-exhaust apparatus, for example, flame, or a system of points at the upper end of the conductor, which is elevated in the atmosphere. In order to get a constant apparatus I have used 400 of the finest needles inserted in a metallic ribbon. This system I have raised in the air by means of a captive balloon, or by a kite, which was attached to a conductor of twine or to a twisted line of the finest steel wire. In this way I have attained a height of 100 to 300 metres. When the lower end of the kite line was communicating with the galvanometer whose other terminal was in contact with the earth, a current passed through the galvanometer. For determining the strength of this current I proposed to call a micro-ampère the 10^{-9} part of an ampère. At the height of about 100 metres on the average the current begins to be regular, and increases at the height of 300 metres to 4,000 or 5,000 of these units. The increase is very regular, and seems to be a linear function of the height. I have, nevertheless, found the smallest quantities of dust contained in the atmosphere or the lightest veil of cirrus disturbed the measurement very materially, and generally made the potential lower. In negative experiments of this nature I have made at Breslau, at the Schneekoppe, and in the "Riesengebirge," especially at the last station, an increase of potential was observed, not only by reason of the perpendicular height, but also by reaching such regions of the atmosphere as were situated horizontally about 200 metres from the highest peak of the same mountain, Schneekoppe. Therefore, it must, according to Dr. Exner, be assumed that the surface of the air presents a surface of equal potential and that the falling surfaces of high potential were stretched parallel over the plane contours of the air, and more thinly or narrow lying over all the elevated points, as for example, mountains, church towers, etc. On the basis of these facts I think it easy to explain the electricity of thunder clouds; in fact every cloud, or every part of a cloud, may be considered as a leading conductor, such clouds as have for the most part perpendicular height. After being induced, the change results by supposing the conduction of electricity either from the upper or from the lower side, according to greater or smaller speed of the air in the height. In the first case the clouds will be charged positive, in the other negative. I am inclined, therefore, to think that the electricity of thunder clouds must be considered as a special but disturbed case of the normal electric state of the atmosphere, and that all attempts to explain thunderstorm electricity must be based on the study of the normal electric state of the atmosphere.

* Abstract of a paper read before the British Association Meeting at Manchester.

Execution by Electricity.*

BY W. D. HOWELLS.

At this season, when every influence and association reminds us of One who died that mercy might live forever in the wills of men, I have been peculiarly interested in the newspaper discussion of the proposition for the substitution of death by electricity for death by hanging in the infliction of capital punishment. It appears that a measure of this kind is to be brought forward in the New York Legislature during the winter, and that there is reasonable hope of its adoption, though I observe that there is a great deal of affectionate regard for the good old gallows-tree among the publicists of the press. In fact, there is much to be said in behalf of this venerable growth of centuries, rooted in the remotest past of our Anglo-Saxon race, and hardily surviving the axe and the stake through every change of policy and religion. Yet there is grave question whether it is not an instrument of torture as well as of death, and whether it is not now our duty, after nearly nineteen centuries of the Christ who bade us not kill at all, to kill by the humanest method known to science. The weight of learned testimony seems to be in favor of electricity, and there is apparently no reason why this mysterious agent which now unites the whole civilized world by nerves of keen intelligence, which illuminates every enterprising city, which already propels trains of cars and promises to heat them, which has added to life in apparently inexhaustible variety, should not also be employed to take it away.

There is a sort of poetical fitness in its use which we ought not to overlook in an age and a country ambitious of amenity as well as humanity. I understand that the death spark can be applied with a minimum of official intervention, and without even arousing the victim, or say patient, from his sleep on the morning fixed for the execution of the sentence. One journal has drawn an interesting picture of the simple process, and I have fancied the executions throughout the State taking place from the Governor's office, where his private secretary, or the Governor himself, might touch a little annunciator-button and dismiss a murderer to the presence of his Maker with the slightest pressure of the finger. In cases of unusual interest the Executive might invite a company of distinguished persons to be present, and might ask some lady of the party to touch the button. Or, as when torpedoes are exploded or mining blasts fired in the completion of a great public work, a little child might be allowed to discharge the exemplary office.

In the event, however, that the Legislature should refuse to touch a single bough of the honored tree which has so long sheltered Anglo-Saxon society, I have a suggestion to make in this matter of executions. I have long thought it cruel to the sheriff and his deputies to force them to this hangman's work, and monstrous to let some imbruted wretch make legal killing his trade; and I have to propose that the executioner should be drawn from society at large, as jurors are, and that no excuse should avail, except the oath of the person drawn that he is conscientiously opposed to capital punishment. This system, which is perfectly practicable, would give, from time to

* *Harper's Weekly.*

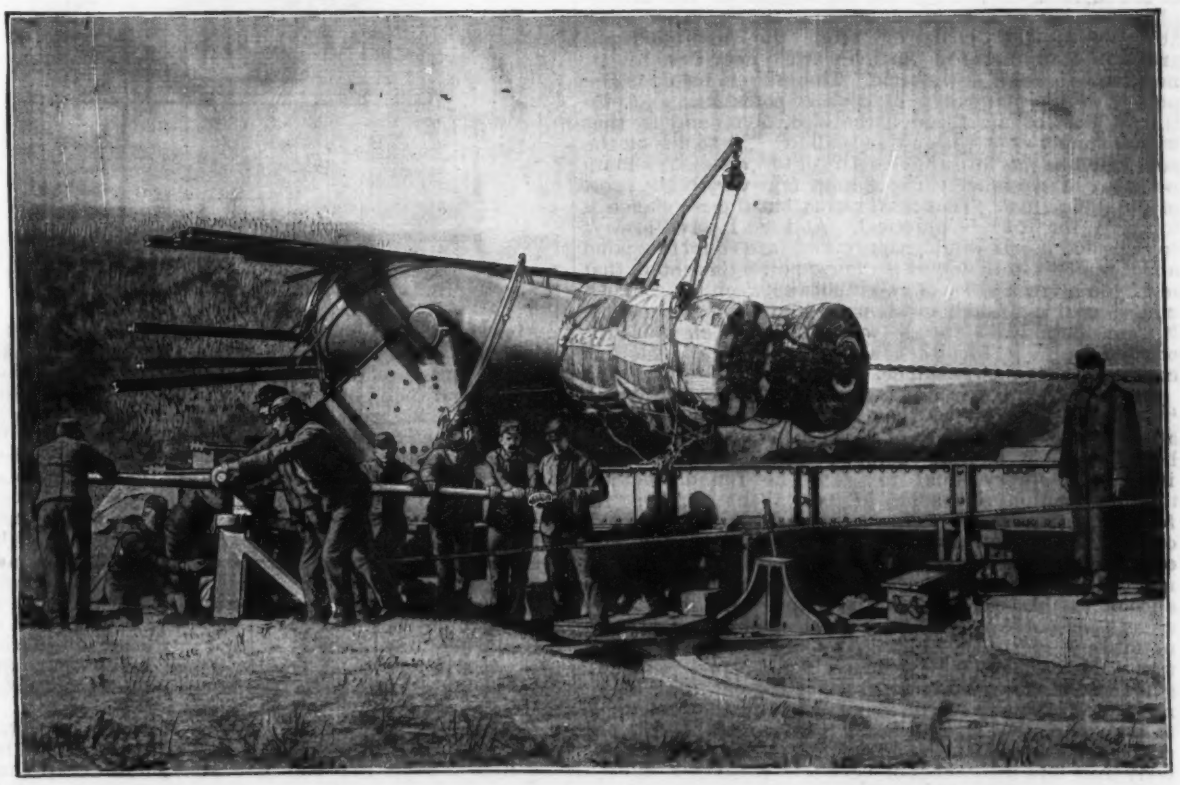


FIG. 1.—AN ELECTRO-MAGNET MADE OF TWO 15-INCH CANNONS.

time, men of profession and station the opportunity to attest their devotion to the great principle that if it is wrong to take life, a second wrong of the kind dresses the balance and makes it right.

Obtaining Electric Energy from Carbon Without Heat.

Below is given brief a summary of the discussion on Mr. Willard E Case's paper on "Electric Energy from Carbon Without Heat," read before the American Institute of Electrical Engineers, on Jan. 10.

Mr. MAILLOUX, who read the paper in the absence of the author, said: "Mr. Case has favored us by sending one of the cells in question. I have brought a little galvanoscope, which I have calibrated for the purpose, so that it gives a rough indication of the voltage of the battery. Each division represents $\frac{6}{10}$ of a volt, and when I close the circuit you will see that it gives a deflection, which is about 14 degrees. That would be equivalent to about $\frac{7}{10}$ of a volt. I think that Mr. Case states that the electromotive force of his battery is between $\frac{7}{10}$ and $\frac{8}{10}$ of a volt; but, unfortunately, as you notice, the electromotive force falls down very rapidly, owing to polarization. You will notice it is now only 12 degrees. It seems to stay there better. But if I let it rest a little while, it comes to more nearly the full strength, though not quite. I might state for the information of the members that Mr. Case says, in a note sent with the battery, that the internal resistance is about $2\frac{7}{10}$ ohms, and that when placed on short circuit it gives, approximately, a quarter of an ampère for a short time. He adds, by way of explanation: "You understand I am not showing a practical invention: simply showing a new principle which may be developed."

Mr. WOLCOTT: I would like to ask why the cell polarizes so. As I understand, the oxidizing liquid is in contact with the platinum. It ought to act, I should think, like the chromic acid in a Poggendorff cell, to oxidize the hydrogen; or is it hydrogen that polarizes it?

Mr. MAILLOUX: Mr. Case states that the polarization can be prevented by mechanical means; so that it is probably due to uncombined chlorine.

Mr. F. B. CROCKER: About that polarization, it is very evident the active material there is ClO_2, and that is in solution in the liquid. The oxygen of that ClO_2 combines with the carbon and sets free chlorine, and that chlorine is set free on the platinum, and that, of course, polarizes the cell. There is also the formation of CO_2, carbonic acid gas, on the positive plate. That also would produce polarization.

Mr. C. S. BRADLEY: The question of resistance is one of the main points in the whole of this subject. I tried in 1882, quite a long series of experiments with fused salts and their action upon coal. Of course the oxygen of the atmosphere is absolutely necessary. We cannot by any means expect to accomplish direct conversion unless we use the oxygen of the atmosphere. Otherwise we must use a manufactured product which must be very expensive. Therefore we have got to introduce the oxygen of the atmosphere, which is just as essential as the coal. That battery costs a great deal more to run, from the chlorate of potash used, than a zinc battery. So that to get cheap power in that way it is necessary to use carbon or hydrogen, or the combination of those, or the oxygen of the atmosphere; and to use the oxygen of the atmosphere you must either supply it at the time you are operating with the coal, or from the manufactured article. Manufactured articles are dear; so it is necessary to use it at the time. Therefore, I hit upon the plan of taking manganate of soda or potassium and putting a blast of air through the electrolyte and by that means supplying it with air and allowing it to act on the coal which is put into another part of the vessel. The main point is the resistance. The voltage falls very little short of the theoretical. That is all right; but the resistance is too high for it to be practical. At least I have always so regarded it. It would require a surface equal to a pond about ten feet in diameter per horse-power (laughter), that is, if you allow a space of two inches between the coal. Of course, coal is a rough substance. You have got to allow it a considerable distance between your plate on which the oxygen supply is furnished, and it is the coal which of course runs up the resistance.

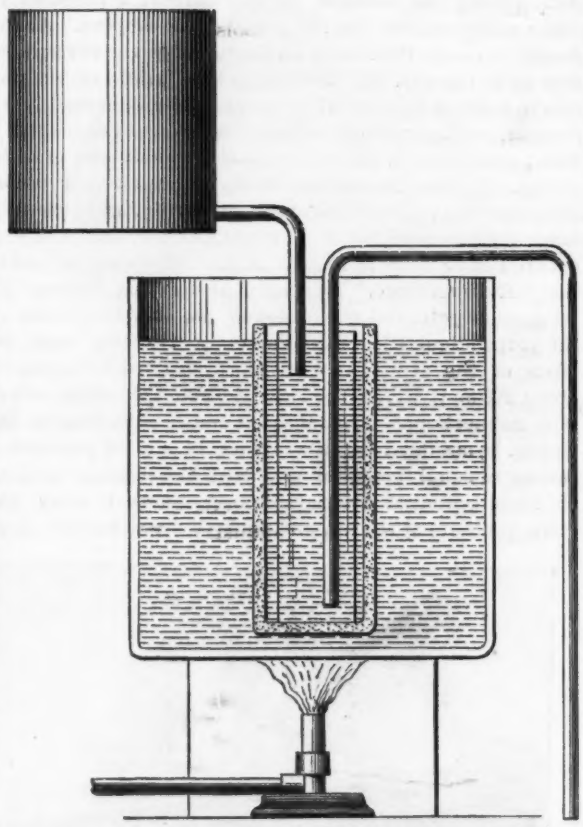
Then, in studying up the matter, I saw in Watt's "Chemical Dictionary" that F. Braun, had a determination of the conductivity of fused salts in the neighborhood of their melting points. Putting the conductivity of mercury equal to zero he found that of the best sulphuric acid to be about 7,700; the following numbers were also obtained: Chloride of lead, 32,200: nitrate of soda, 11.475, and so on. But, of all the records I have ever found, and in all the experiments I have tried, chloride of lead is of the lowest resistance or the highest conductivity among the salts. It is about four times as good as the best sulphuric acid. We noticed in some of the electrical papers of a late date mention of Mr. Acheson's device, in which he proposes to use gases in one case. Now, gases are of a great deal higher resistance than any fused electrolyte, and the fused electrolyte, of course, is, as I said before, too high. The lead chloride is the lowest. It is possible, of course, that somebody may find substances of very low resistance, but it is rather a hard job. Now, of course, I do not mean to advance this as a pessimistic view of the matter at all. It is just simply to make a statement of the conclusions which I have reached, which I hope may be of benefit to others, and perhaps save them some experiments and time.

Mr. WEIZLER: The previous speaker, in criticizing the apparatus devised by Mr. Acheson, in which gases are used as the medium between the electrodes, has remarked that they are of very high resistance. I think that is a question of relativeness merely. I do not know what the absolute resistance of the fused products which the previous speaker employed is, but we all remember the experiments originally made by Faraday, who, after placing the points of an electric circuit a short distance apart, heated up the terminals of the platinum wires and effected the passage of the current thereby. You also know that if we heat the air sufficiently, as is done in an electric arc, we get comparatively low resistance.

Mr. BRADLEY: I also made this experiment: I employed an outer vessel of zinc in which was placed a porous cup containing a bar of zinc. The outer vessel was filled with a concentrated solution of zinc chloride; and the porous cup was fed by a constant stream of fresh water to maintain the solution within it dilute. (See illustration.) The vessel was then heated by a Bunsen burner from below.

In that way I could control it so as to keep the inner zinc cool while the outside dish was heated. It is well known that chloride of zinc has a high heat of solution. My idea was, that if I could keep a strong solution in the outer vessel, just on the point of crystalizing, in contact with the zinc, and a weak solution within the porous cup, I could cause a passage of the molecules of zinc across and a current to be generated. The calculated electromotive force from the arrangement was 3-10ths of a volt. I worked at it a good while before I got 3 10ths of a volt, but finally I did get it. The question of resistance, of course, comes in, and that is the greatest difficulty in all apparatus of this kind. On weighing the outer vessel and the interior plate the latter should have lost and the former should have gained. But I found that the inside one had lost, but it was hard work to find that the exterior one had gained anything. So it left me in doubt whether the 3-10ths volt was actually due to the heat of solution or not. But it is quite interesting as an experiment.

Mr. CROCKER: The question of equi-volts is rather an interesting one. I shall not go into the figures, but I think Mr. Sprague, of England, has done the subject a good deal of harm by prefixing that "equi" to the well known term "volt." People are used to that word, but the result of prefixing "equi" to it has been that people have let it alone, just as if he had attached a dynamite bomb to it. And really I do not see why it is put there. An equi-volt, as far as I can see is just as much a volt as any other volt. It is well enough, perhaps, to designate volts obtained by chemical action as equi-volts; but I do not know any reason for it. You might just as well separate volts obtained by an Edison dynamo and call them Edi-volts. Really these equi-volts are just plain, ordinary North American volts. And I think if that were used more—the calculation of the volt of chemical action—it would be of great service in a great many cases For example, Mr. Bradley and I, before we had made any experiment at all on the subject, calculated out what would be the electro-



BRADLEY EXPERIMENTAL BATTERY.

motive force of a combination of zinc and bromine; we calculated just as Mr. Bradley described there, by taking the heat units produced by the combination of zinc and bromine and then going through those figures we obtained $1\frac{8}{10}$ volts. By a great many experiments very carefully carried on we got $1\frac{78}{100}$ volts. Now that is just $\frac{2}{100}$ different from our calculations. At first we got $1\frac{8}{10}$, because, of course, the instrument would not detect that $\frac{2}{100}$ difference. It was only by continual experiments that we got the average of $1\frac{78}{100}$. Now that is close enough for all practical purposes, and you can arrive at results which are practically close enough, with a combination of zinc and iodine for example, or any combination of two elements, or an element and a compound body. For instance, you can calculate out the electromotive force of zinc and chromic acid, or nitrate of soda or any other depolarizer, and you will arrive at results which approximate quite close enough for practical purposes to the actual electromotive force obtained by experiment.

Now that seems to me to be a very important thing, because very often you want to find out these facts and have not time to try it and you save yourself the experiment by calculation; and of course all kinds of short cuts like that are very often quite an advantage to the investigator and, so far as I know, it is very seldom used. Mr. Sprague is about the only authority who speaks of it at all, and in practice I have never met any one who used that method. Some people doubt that you can get reliable results at all. They claim that they are mere accidental coincidences, but I think when they occur a great many times and when you can actually prove by the figures that there is such a relation, then there can be no longer any doubt about it.

The contact theory has also prevented the adoption of this calculation of electromotive forces. The idea is that there is a contact difference of potential; that it is not due to the chemical action, but is due to the contact; that chemical action merely makes the action continuous. I never could see much in that contact theory myself. If you have a plain chemical affinity there and that produces so much energy in the form of heat, for instance, why shouldn't it produce the same amount of energy in the form of electricity in a voltaic cell. The contact theory is one of those things that you cannot see any reason for—why should zinc and bromine have a contact difference of potential of $1\frac{8}{10}$ volts? Whereas you *can* see a reason why they should have a certain chemical electromotive force. The contact theory is a purely arbitrary thing. A man tells you there is a contact difference of so-and-so. There is no reason for it that I can see, and the fact that the contact difference of potential is usually the same in liquids as in air, is due to the fact that there is oxygen, moisture, etc., present in the experiments, and you have substantially the same conditions that you have when you try them in a voltaic cell,

And those two theories of contact difference of potential and the "equi-" prefix to "volt" have retarded a very important branch of science, I think.

Mr. WOLCOTT: I do not understand why the zinc would be dissolved off from one electrode and deposited on the other. Does the chloride of zinc dissolve the metallic zinc?

Mr. BRADLEY: The Grotthuss hypothesis is generally understood. There is a chain of molecules of chlorine and zinc, all the way across the electrolyte, If there is more affinity for the zinc on one side than there is on the other, the zinc will cross over as soon as the current is closed.

Annual Meeting of the Gold and Stock Life Insurance Association.

The Gold and Stock Life Insurance Association held its tenth annual meeting in Western Union Building, Jan. 9, and reported the year just closed as the most prosperous since its organization.

The following named officers and standing committees were unanimously elected to serve for the ensuing year:

R. J. Hutchinson, president; A. J. Driver, vice-president; W. J. Dealy, secretary; M. Breslin, treasurer.

Executive Committee—R. J. Hutchinson, Wm. J. Dealy, J. W. McLaren, E F. Cummings, A. J. Driver, M. Breslin, C. P. Flood, T. J. Sullivan, W. H. Collins.

Auditing Committee—F. W. Baldwin, J. M. Moffatt, W. H. Jackson.

Mr. M. J. O'Leary, of Room 58, Western Union Building, is the clerk of the association.

The Storage Battery Challenge.

To the Editor of The Electrical World:

SIR: In your issue of Jan. 7, I find the reply of Mr. Wm. Wharton, Jr., to my last communication. Mr. Wharton's philosophy, it seems, does not admit that a muddy track means a greatly increased expenditure of energy. Of course that settles it, and so much the worse for the fact of its being so. It were therefore mere waste of space to say more about it, at least until Mr. Wharton enters the domain of practical work with his car, and ventures to try conclusions with a muddy, ungraded, suburban track.

Now for the purpose of removing Mr. Wharton's apprehensions about his 63 mile record, I will say that I hope he may succeed in making 100 miles, since his tastes run in that direction. I am satisfied for the present to stop at a 50 mile capacity, for the simple reason that my efforts with the system placed in my hands are directed toward the purely practical instead of the surely wonderful or phenomenal. The storage battery, in the present state of of the art, will give better results with two charges for daily runs of over 50 miles. It would not be impossible to provide sufficient storage capacity to run 100 miles, but, at the present stage, such a performance would be interesting to me only as a *tour de force*, and I cannot see that it would have any usefulness unless it were for advertising purposes. But possibly even Mr. Wharton understands this.

As for myself I am studying the problem before me from the standpoint of the engineer, with a view to real business, and I deem it preferable in every way to reckon with the cost of the car, the weight, efficiency and durability of the motor and battery, the size of the coal bill, and a few other things worthy of the same considerations as factors in the great equation of efficiency. In other words, I am after results which can be duplicated and repeated day after day in regular practice, and which will give the maximum return for the least expense.

A few words in concluding, about Mr. Wharton's joke—his challenge. I was greatly amused, but at the same time I was surprised that the odds were not made greater, for Mr. Wharton certainly must have felt sure that I could not accept the challenge, owing to a circumstance of which he is scarcely in ignorance, namely, that the gauge of New York city roads is some 5¾ inches narrower than Philadelphia gauge. I would have liked very much to accommodate Mr. Wharton, not for a wager, nor for three runs, but for comparison in cost, economy, and in all respects. Had Mr. Wharton spoken sooner we might have been able to arrange matters. The Julien car has now begun daily service and will be run for passenger traffic, within a few days, on the Fourth Avenue line, where it will shortly be supplemented by ten new electric cars on which I am now engaged. The work is also in progress at the charging station at Eighty-fifth street and Madison avenue. The Julien system will, therefore, beyond doubt, be the first in regular service in America, just as it was in Europe. Mr. Wharton need not wait long, therefore, to get all the opportunities he might wish to "size up" the Julien system, not with reference to one factor alone, but with reference to all the conditions, as they exist in actual service. The information will undoubtedly be more valuable and will not cost him so much.

C. O. MAILLOUX,
Consulting Electrician to the Julien Electric Co.

NEW YORK, Jan. 9, 1888.

An Electric Megascope.

In magic lanterns, as is well known, transparent slides are used, but in the apparatus of a similar nature, called the "megascope," projections of opaque bodies on the screen can be obtained, such as photographs, coins, statuary, works of watches, etc. The objects are placed at the back of a dark chamber, subjected to a light as intense as possible, and then projected in the usual way.

A large number of megascopes have been brought out. One of the most recent and effective is that invented by M. Trouvé, who has made so many ingenious electrical instruments and toys. We reproduce the illustration of it from *La Nature*. The apparatus is lighted interiorly by one or more small incandescent lamps. It consists of two cylindrical tubes adjusted at a predetermined angle—such as that in the cut—the upper tube carrying the lamp and its parabolic reflector, the other containing the ordinary photographic objective; and at the apex of the angle formed by the junction of the two tubes is placed the subject that is to be thrown, enlarged, on the screen. The lamp used can, of course, be lighted by three or four bichromate cells, by storage batteries, or in any ordinary way, and its use renders the exhibition of the megascope very easy and pleasant. M. Trouvé calls his apparatus the "anxanoscope."

Wright's Automatic Telegraph.

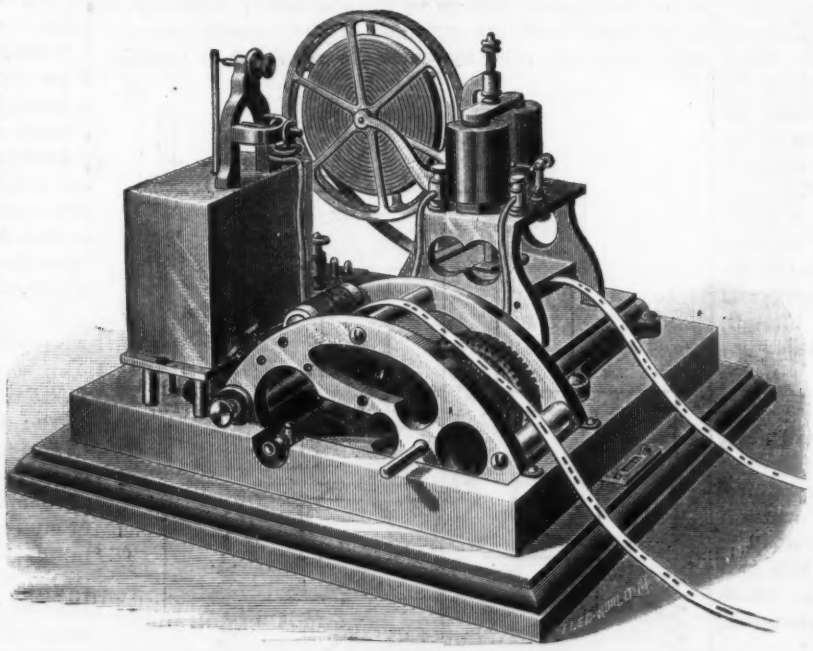
We illustrate on this page the automatic telegraph apparatus that has been invented and patented by Mr. Chancy G. Wright, of Chicago. The cut shows his receiving perforator and transmitter. By this machine it is claimed a message can be sent across the continent, and relayed one hundred times if desired, without operators, except such as are necessary to keep the instruments in adjustment. The receiver works on the local circuit, and can be used on the quadruplex, as well as on the single wire system wherever a sounder can be used, as in the ordinary system of telegraphy. The dots and dashes are received on tape, perforated, thus forming an indelible and perfect record of what has been sent. To relay the message thus received it is only necessary to pass the tape through the transmitter. This operation does not in any way injure the tape, which can be used any number of times.

The machine is simple in construction, containing no parts likely to get out of order. The automatic receiver requires, it is said, no more adjustment than an ordinary sounder. The manner of perforating the tape is as follows: There is a small punch, actuated by an electro-magnet, and circuit-breaking device, which is kept in operation when the circuit is closed. As the tape is kept in motion by clockwork, the punch, which moves with great rapidity, cuts a dash in the tape. The opening and closing of the circuit, as the Morse characters are made, reproduces them exactly in dots and dashes on the tape. The danger of tearing or checking the tape, which would result from pulling the paper when the punch is in operation, is obviated by a device for pushing the paper tape through guides so made as to admit of a slight buckling of the tape.

The transmitter has a perpendicular rod, with a small foot at the lower end, and pivoted at the bottom. On the end of the foot is a small wheel, under which the perforated tape is passed by means of clockwork. The contact is not made through the perforations, but at the top of the rod, the closing and breaking of the circuit being effected as the wheel drops into the perforations or runs upon the tape. In other words, whenever the wheel drops into the perforations the circuit is closed. The point of contact being removed from the tape, all danger of interruption from fibres of the paper is obviated.

There is said to be practically no limit to the capacity of the transmitter; and the receiver, on test, has done its work equally well at 30 and 45 words per minute.

It will be evident that the system is well calculated to save labor, as, for example, in the handling of press reports, or in main offices in cities in transferring branch office messages to the trunk lines. It is also claimed that by its use long circuits, which are always troublesome one, was for the other, could be divided up into a number of short circuits, formed by placing these machines along the line at convenient intervals.



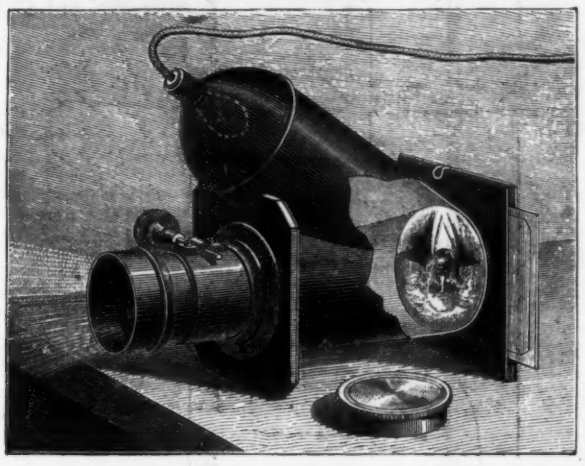
THE WRIGHT AUTOMATIC TELEGRAPH INSTRUMENT.

To Use the Morse Alphabet on the Cable.—This morning Col. Webb received news of the most important telegraphic discoveries by a friend, Charles Dion, a Canadian by birth, but a citizen of the United States. Mr. Dion was the original inventor of the fire alarm system now so generally used, with slight improvements throughout this country. For many years he has been engaged in seeking a method of telegraphing the Morse system over the Atlantic cable, and is confident that it can be done at the full speed. Mr. Dion further hopes to apply the Wheatstone system. Should he succeed at working the Morse system it will quadruple the speed of ocean cables.—*Pittsburgh Press.*

The Proposed Bill to Appoint a Commission to Amend the Patent Laws.

BY EDWARD C. DAVIDSON.

Only upon careful consideration does one realize to what extent the patent laws of this country control its industries. From the clearing of the ground to the reaping, shipment, storage and final utilization of the products of the soil, the various operations are performed with the aid of indispensable machines, now seemingly perfect, representing the final development of a long period of evolution rendered possible by the fostering influences of our patent system.



THE ELECTRIC MEGASCOPE.

In the production of metals from their ores and their final fashioning into numberless tools and machines, and in every industrial or commercial enterprise, the values depending upon patent protection are enormous. In every household the beautifying and civilizing influences of inventive genius are to be found. Unquestionably the rapid advances and marvelous inventive activity which this generation has witnessed have been a direct growth from, and in a measure proportional to, the liberal spirit of our patent laws.

Having then a law liberal, broad and comprehensive in its terms and effects—one which has been a model for several leading nations—shall we consider it lightly, charge it with manifold insufficiences wrought out by an ideal contemplation of what one thinks a patent law should be, and rashly throw it open to the dangers of attack from its enemies, and the perhaps equally dangerous, though well meant, tinkerings of its friends?

The National Electric Light Association, an organization composed of gentlemen interested in a considerable, though relatively limited industry, proposes to invite a general examination of the law with a view to the introduction of numerous modifications which they deem essential. I shall not discuss the merits of many specifically suggested amendments, but shall briefly state several reasons why, in my opinion, the proposed bill is inexpedient and mischievous.

In the first place the proposed action represents the opinion of a comparatively small body of men, and has been reached as a conclusion upon what seems to be a hasty and immature consideration and discussion of the subject. In 1877, when Mr. Chauncey Smith and Mr. J. J. Storrow, of Boston, and others were actively interested in an effort to procure amendment of the patent laws, a phamphlet fully setting forth what was proposed and had been done, and inviting comment and suggestions, was generally distributed among patent lawyers and others interested. Replies representing the opinions of those sufficiently interested were received, consultations were held, and finally the bill before Congress was presented in a form which purported to represent the best sentiment on the subject. Would not such a general consideration of the present proposed action be a prudent and desirable course? There is room for a wide diversity of opinion as to the propriety of asking for the appointment of a Commission, and so strongly is adverse feeling manifested in some quarters as to suggest the thought that active organized opposition to the bill may be made by citizens equally interested in the law of patent protection. The members of the National Electric Light Association not only represent a relatively small value, but they also derive their impressions from difficulties experienced in procuring and working patents relating to a limited field of invention, viz.: The class of electricity. Their point of view as well as extent of interest is relatively small. Have the gentlemen in charge of this matter any assurance that they will not meet with opposition in and out of Congress from interests far exceeding their own in extent and value? If the bill is defeated it will be because of opposition from such a source, for the very active opponents of patent protection will be found among its most energetic supporters.

If the bill should be passed, what guarantee exists as to the character and competency of the Commissioners to be appointed? Assume that they will be honest and of apparent ability, they may or may not be able to so deal with the question as to arrive at correct conclusions and report an amendment which will really be an improvement of the law, and they might do incalculable damage. The interests involved are great—they not only rest upon the words of the present statute, but also upon a line of judicial decisions conceived in a spirit of liberal friendliness to patent protection. Is this not to be considered? The stake at issue is large enough to call for the exercise of the utmost conservatism and prudence. To what a commission might bring us we know not.

I have heard it stated by those who have appeared prominently in connection with this question, that there is no opposition to—no spirit inimical to—the fundamental principles of our patent law, either South or West. Generally such views have been stated to be based upon personal observations and impressions derived from contact with men from different sections of the country. I cannot deny these assertions from a knowledge born of personal contact with those who are enemies of patent protection. Indeed, it may be admitted that the number of persons who express themselves as unfriendly to the "principles" of patent protection is insignificant and not to be considered. But, I take it, there is a large class of persons who desire changes in the law which, while not ignoring the "principles" of patent protection, curtail and abridge its value. Perhaps no better indication of the animus and direction of attacks of such persons exists than that shown by the bills they have caused to be introduced in Congress. No attempt is now made to give a complete list of such bills for any period of time, but I merely refer to a number introduced in the Forty-ninth and Fiftieth Congresses. In the first session of the Forty-ninth Congress at least four bills to "protect innocent purchasers" were introduced, all drawn in a way to materially abridge the value of patent protection, and two of them contained provisions that the United State Courts should not have jurisdiction to try cases against "any person or citizen of the United States or territories wherein the amount in controversy does not exceed two hundred dollars against one person or citizen." At least one "Innocent Purchaser" bill has already been introduced in the Fiftieth Congress. In the Forty-ninth Congress the following bills were presented: To make the term of patents seven years; to vacate and cancel patents under which manufacture is not permitted; to extinguish patents upon the payment to the owner of a sum to be determined by the Secretary of the Interior; providing that any State may declare "that any patent issued * * * is void for want of novelty or usefulness," and may ask the Attorney General of the United States to "institute such proceedings and take such steps to cause such patent to be withdrawn, vacated, canceled," etc.; to prevent monopolies by providing that any one who pays to the patentee ten per cent. of gross sales shall have right to make and sell; to repeal the patent laws and establish a system of awards to inventors, whether an invention is "valuable" being determined by a "committee of experts" at the end of one year from the date of grant; to prevent the withdrawal of a machine or process from public use because of any regulation of the tariff of charges by the Legislature of any State or territory; to provide for compulsory licenses.

These illustrations are sufficient to show that there is a feeling in and out of Congress unfriendly to the present scope of patent protection, if not adverse to its "principles." Indeed, the apprehensions of some prominent manufacturing firms have led them to employ special counsel to resist such efforts in Congress. Is there not then some danger to be feared in the event of the appointment of a Commission? I think there is, and particularly so since the advocates of the proposed bill not only contemplate

the correction of some disadvantages attending the administration of the law as it now stands, but also seek to extend its operations and scope for the benefit of patent-holding interests.

If the Committee of the National Electric Light Association can conceive and formulate a law which will remedy the real and supposed insufficiencies of the present statute, let them do so and have it presented to Congress. They will, to the extent that their proposed amendments can be approved, receive the cordial and efficient support of those who are now and have been for a number of years endeavoring to obtain beneficial legislation from Congress.

Amendment of the law in two directions is generally deemed essential; first, with reference to procedure in the Patent Office, and second, with reference to judicial contests. As to the latter, the practice is perhaps as well fixed as that of any other branch of the law, though some amendment would be desirable. Since some attorneys and solicitors of patents have advocated the appointment of a Commission, I may state that there is a general opinion among those who have had long experience in practice before the Patent Office, that practically all the evils which are now so rife may be obviated by providing more room and an increased force, and possibly an increase of salaries of some classes of officials. The present procedure is simple, and would be efficient if properly equipped. Much has been said about the want of uniformity of rulings in the Patent Office. Assuming that it is possible under any circumstances for a large body of men, acting individually and dealing with an infinite variety of facts and questions of law, to render uniform rulings, then it might be admitted that by some method the rulings of the office could be materially improved in this regard. But such is not the case. The point of view varies with the individual, and the temperaments and mental operations of men are more various than the questions presented to them for determination. We pat-

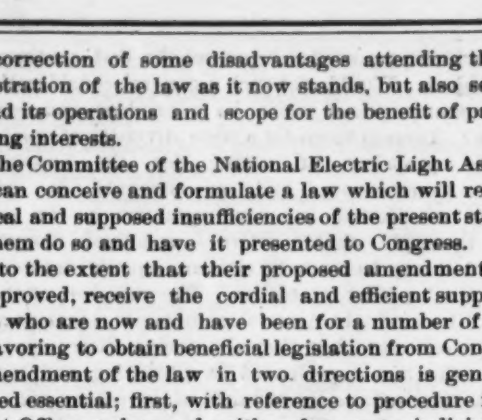


FIG. 1.—MAQUAIRE REGULATOR.

ent solicitors must accept this diversity of ruling as a fact—it is not fatally material—and each deal with it to the extent of his ability and skill, so as to procure for his client in every case the full measure of protection to which he is entitled under the law. Let the solicitor approach the examiners with a feeling of respect, a willingness to believe that some of their rulings may be correct, or fairly debatable, even though they differ with his views.

Let him withhold the breath of scorn that he is prone to fiercely blow upon those who in the discharge of their duty differ with him, and let him remember that if the examiners' decisions were always absolutely right, and an applicant could always word a claim to suit himself, his functions as a solicitor would to a considerable extent be no longer required.

Maquaire's Electro-Dynamic Balance or Regulator.

In a patent recently issued to M. Maquaire, in France, there is described a system of maintaining a constant current or constant resistance by means of a movement or by means of an equilibrium arrangement. For this purpose the inventor has adapted an arrangement in which the regulating forces employed are exclusively electrical, and which is composed of two distinct parts, viz.:

1. A sensitive electric motor of which the speed and the direction of rotation are subjected to electric forces solely; and

2. An arrangement for transmission having little passive resistance, and which spreads the work over a long period of time in order to reduce as much as possible the work of the motor during a unit of time.

The electric motor which is brought into requisition here is that of Tchikoleff, which, with some changes, is shown in the accompanying illustration, Fig. 1. *A* is a Pacinotti ring, *NS* being the polar line, in which the magnetic core may be made of a single piece or of several. Over the winding the armature is covered with an envelope of iron in communication with the magnetic core which thus gives a more regular and continuous field between the pole pieces and the armature.

As will be seen in the case of the arc regulator, the coils *b b'* are placed in shunt to the arc *a*, and the coils *c c'* are energized by the main current, the armature winding being either in series or in shunt circuit. If the free poles are *N'* and *N''*, there are formed two south poles at *S' S''*; but in this particular case these two latter poles, instead of neutralizing each other, act on the ring as if they were free poles. As a fact, when there is an equality of energy in the two coils *b b'* and *c c'*, the poles *S'* and *S''*, having equal values, are situated equidistant from the point *N*.

When, on the contrary, the conditions of normal regulation are modified and the energy, for example, is

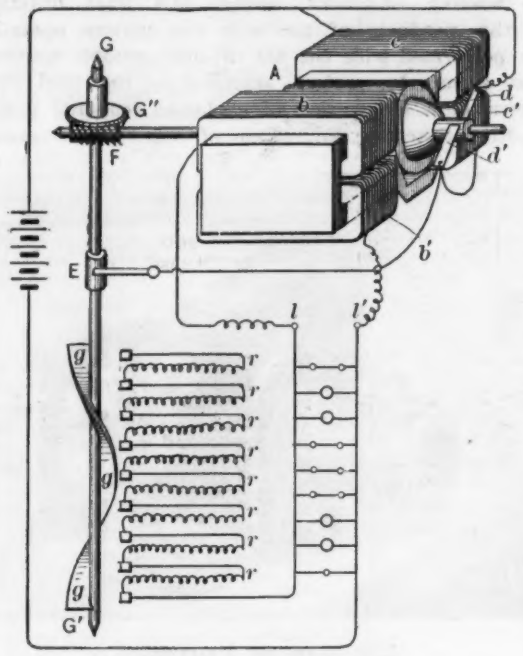
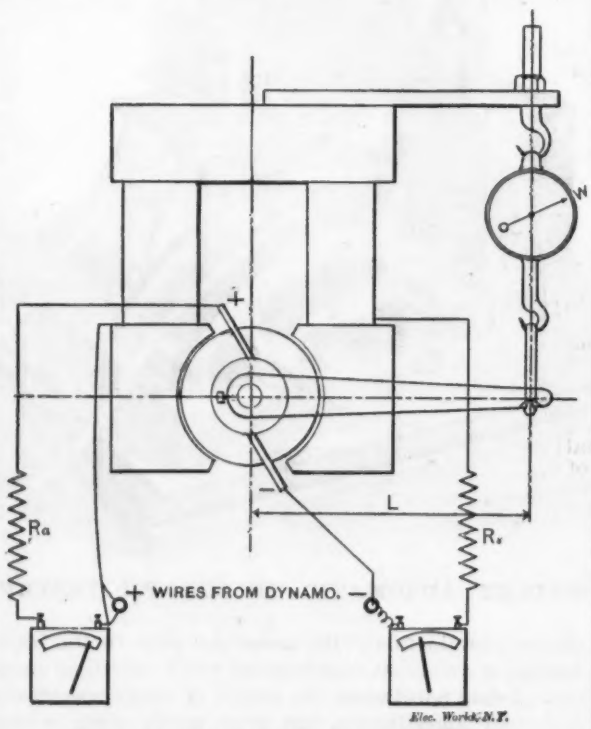


FIG. 2.—MAQUAIRE REGULATOR.

greater in *b b'* than *c c'*, *S''* increases in strength and approaches nearer to *S'*. From this there results a disturbance of the equilibrium of the pole *N* and the armature *A*, which tends to turn in that direction; while, on the other hand, it is attracted in the same direction by the preponderance due to the same cause of the pole *N'* over the pole *N''*.

The arrangement shown in Fig. 2 shows the application of the arrangement to a regulator for governing the current from a battery. The current passes into shunt coils *c c'*, and into the armature by the brushes *d d'*, and from there to the sleeve *E* in contact with the spindle *G G'*. The latter is set in motion by the endless screw *F*, which is carried by the shaft extended from the armature and which gears with the worm wheel *G''*. During the movement or rotation of the spindle *G G'*, a helicoidal sheet of metal *g g* touches successively the contacts of a series of resistances *r r* shunted around the line circuit; finally, at the two points of the distributor the current is taken off, which energizes the coils *b b'* of the regulator. It will be seen that the electro-dynamic balance is set in motion in one direction or another by the addition or withdrawal of resistance until the strength of the current has obtained a normal value by which the regulator is brought



DYNAMOMETER WITH STATIONARY MOTOR.

to a standstill. It will be seen that, as shown in Fig. 1, the regulator is designed, among other things, to be used as the regulating mechanism of an arc lamp.

Measuring the Torque of Motors while Stationary.

BY R. S. DOBBIE.

Having devised the following modification of Prony's dynamometer, and having seen nothing like it suggested before, the writer submits it to the criticism of the numerous readers of THE ELECTRICAL WORLD. The object sought is to measure the turning moment (torque) while the motor is at rest, but with the normal current passing through armature and field magnet coils.

The method of procedure is as follows: We have, for instance, a shunt wound motor doing certain work at 1,000 revolutions per minute (*N*); and while doing this duty a current of 100 ampères is passing through the armature coils and 5 ampères through the field magnets.

In order to make the test, a lever is clamped or otherwise rigidly fastened to the shaft, and projecting at a right angle to the axis of the shaft. At a determinate distance (*L*) from the centre of the shaft a spring balance or scales *W* is attached. Then by means of adjustable resistances, R_a and R_s, the normal currents (in this case 100 and 5 ampères) are sent through the armature and field, respectively. This causes the motor to attempt to rotate with a certain force (*W*), which is indicated by the balance. Then: $.0001904\ L\ W\ N =$ h. p. indicated.

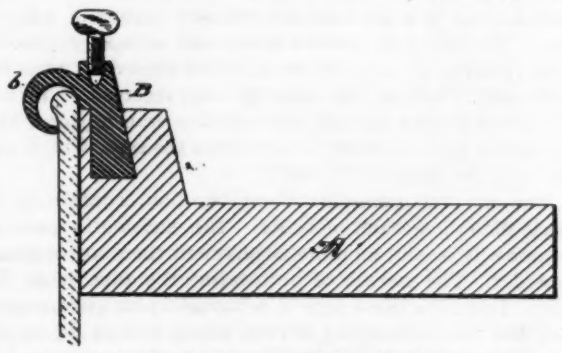
It is obvious that with differentially wound or other motors the same principle can be applied.

Two or more measurements should be taken, one with each brush on *one* segment and again with each brush on *two* segments of the commutator. With machines having very few segments, several more would be necessary, but with the usual modern construction, where at least 30 segments are found in the commutator, even one determination is quite accurate, as I have found by comparison with the electrical measurements $\frac{C\ E}{746}$.

The advantages of this method are cheapness of apparatus, quickness of determinations (not to mention the absence of water to keep a brake cool); and no assistance is necessary, as the experimenter can easily adjust one or two rheostats and keep his eye on two ammeters and on the spring balance, as he is not obliged to hurry.

An Improvement in "Crowfoot" Zincs.

A serious difficulty encountered in the handling of the "Crowfoot" zinc is the liability of the post and hook to break off. The device, of which we show a cut, designed



BEATTIE IMPROVED ZINC TERMINAL.

by Mr. John Beattie, Jr., of Fall River, Mass., quite effectually overcomes this difficulty.

A supplemental post of brass or other flexible material *B* is provided with a hook *b* and binding post, and at its base is formed into a dovetail. When the zinc is cast, the supplemental post is placed into the mold and the molten zinc poured around it, inclosing the dovetail end of the post and holding it securely in the zinc *A*. The hook, which rests over the edge of the jar, being of brass, may be bent to fit a jar of any thickness, and also may be bent down upon the jar to hold the zinc securely in place. This, of course, cannot be done with the hook on the ordinary zinc.

Long Life of a Westinghouse Lamp.

To the Editor of The Electrical World:

SIR: Having seen in a late issue of your valued paper an account of the remarkable long life of an incandescent lamp, I take the liberty of sending you an account of the phenomenal record of a Stanley (Westinghouse) lamp now in my possession taken from the Denver *Republican* office in this city. This lamp has been in constant circuit for a period of 7,201 hours, or from Jan. 12, 1886, to Jan. 3, 1888, on an average of 10 hours per night. This lamp was supplied from an S. H. Short compound-wound dynamo of 100 volts E. M. F. The above can be substantiated by Mr. K. G. Cooper, the manager of the *Republican*. That paper, by the way, is now about to put in another dynamo of 150 light capacity, being satisfied it is by far the cheapest as well as the best light in the market. The excellent paper in question has been always the stanch friend of electrical enterprise in this State. C. M. MCCARNY.

DENVER, Col.

Electric Lighting in Central America.

To the Editor of The Electrical World:

SIR: Your Chicago correspondent was mistaken in stating "that the streets of Panama, Central America, are now brilliantly lighted by electricity." In Colon we have a Thomson-Houston plant, running thirty arc and three hundred incandescent lights. It was generally believed that the same company was to erect a plant in Panama, but I believe that there is some difficulty with the local gas company, which had a concession for a certain term of years. The gas is so exceedingly poor that everyone wishes the change to be soon. In the lower portions of the city one cannot use the gas until

late at night, but the meter gets there just the same at the rate of $7.00 per thousand feet.

The charges for the electric light in Colon are: 1,200-candle arc lamps, 7 and 11 hours, $1.00 and $1.20 per night; 16-candle incandescents, 7 and 11 hours, $3.00 and $4.00 per month; all in U. S. gold.

It is rumored that a company is being organized here to erect a Thomson Houston plant in San Salvador. These two cities are on the route of all travelers between the west coast of Central and South America, and the United States and Europe, and many inquiries are made as to the cost of construction and maintenance, rates charged, profits, etc., by parties going through here, and having in view the erection of plants. Panama, by the way, is not in Central, but in South America.

COLON, U. S. C. G. DEAN.

On a New System of Underground Electrical Conductors.

BY DAVID BROOKS.

As early as 1877 I laid some wires experimentally in West Philadelphia, using rosin mixed with paraffine oil in the terminals or that portion above ground. Three years since I used rosin and rosin oil mixed in the terminals of the cable I laid for the Metropolitan Telegraph and Telephone Company in New York. There were probably twenty of these terminals coming out of the ground and going up by the side of the poles, say fifty or sixty feet, and there the wires were distributed, or, as the common expression is, "fan out." In order to get this mixture into the iron pipe, we first ran through a quantity of hot oil to sufficiently heat the pipe to keep the mixture fluid that followed until it had gone the full length of the pipe, or, in other words, filled the pipe.

Something over a year since, five hundred feet of lead-incased cable insulated with rosin and rosin oil was sent to the English Post-Office Department for experimental purposes. Mr. Preece, the government electrician, refers to it in the *Journal of Telegraph Engineers and Electricians*, No. 67, Vol. 16, May 26, 1887, page 429, in the following words:

"It has a most remarkably high insulation. Some samples that Mr. Kempe tested a short time ago gave a result of 19,000 megohms per mile, which was so high that I had some doubts of its permanence. The first test was made in the early part of the year; last week Mr. Kempe tested it again; and again the same material gave exactly 19,000 megohms per mile. Well, I think when we get materials with such a high insulation as that, with sure indications of its permanence, there is some hope that we have something that will make us independent of fraudulent gutta percha."

This excellent insulating quality has for years made itself manifest and caused me to endeavor to make use of it in iron pipes instead of lead, iron being so much cheaper, more stable and in every way preferable.

To this end Patent No. 356,981, February 1, 1887, was taken out, and the first work under that process has lately been completed on the Pennsylvania Railroad from Broad street station to the station at Thirty-second and Market streets, Philadelphia, a distance of one and one-third miles.

It should be borne in mind that this cable has eighteen splices, and that it is impossible or exceedingly difficult for the insulation of a splice to be made equal to the balance of the line. The German government allows the insulation of a splice to equal that of three miles of the line, and according to their calculation we should allow fifty-four miles to be added to the length of these conductors as an allowance for splicing; if we do this, the figure for insulation is much higher than that given by Mr. Preece. The following are the tests made by three different parties:

First. By Dr. Cresson. Test of Brooks Cable at Broad Street Station, Philadelphia, Dec. 11, 1887. Thermometer 59 degrees F. Insulating material, rosin and rosin oil. Length of cable, one and one-third miles. Number of conductors in the cable, fifty-three. Gauge of conductors, No. 1, or core wire, No. 18, balance No. 16. Test made on four conductors, the other forty-nine being grounded at both terminals.

Insulation Test.—Number of cells of battery, 100; 29,500 divisions on the scale; constant per megohm = 2,950 divisions; deflection after one minute electrification, No. 1 conductor, 18 gauge, 18 joints, no deflection; No. 2 conductor, 16 gauge, 18 joints, no deflection; No. 3 conductor, 16 gauge, 18 joints, 2½ deflection; No. 4 conductor, 16 gauge, 18 joints, no deflection; Nos. 1, 2, 3 and 4, bunched or connected as on wire deflection = eight. Total insulation = 369 megohms on five and one-third miles of wire = 1,968 megohms per mile, eighteen joints in each conductor = seventy-two joints, and allowing three miles per joint = seventy-seven and one-third miles of wire = 30,763 megohms insulation per mile.

Electro-Static Capacity.—By Elliot Standard Condenser.

CABLE DEFLECTIONS.

	Charge.	Discharge.
No. 1	1,300	1,300
No. 2	1,750	1,800
No. 3	1,700	1,750
No. 4	1,750	1,750

Note charge and discharge are nearly the same, indicating high insulation. Comparison of cable condenser by discharge: No. 1 = .157 mfds. per mile; No. 2 = .218 mfds. per mile; No. 3 = .212 mfds. per per mile; No. 4 = .212 mfds. per mile.

CHARLES M. CRESSON, M. D.

Second. By Carl Hering.

PHILADELPHIA, Dec. 8, 1887.

Mr. David Brooks.

DEAR SIR: At your request I have this day made a test of your cable of wires, leading from the Broad street station of the Pennsylvania Railroad in this city, to Powelton avenue station, a distance which you say is about one and one-third miles, the cable consisting of fifty-three wires.

The constant of the Thomson unshunted galvanometer was found to be 1,750 degrees per megohm. When only one wire was measured for insulation, the deflection was not perceptible; all of the fifty-three wires were therefore connected together and the deflection found to be only 11 degrees, the zinc pole being to ground. The insulation resistance was therefore 159 megohms for fifty-three wires of one and one-third mile each. This gives the remarkably high insulation resistance of 11,200 megohms per mile of wire.

The capacity was then measured, first with four wires charged and the other forty-nine disconnected, and second with the other forty-nine wires grounded. The constant of the galvanometer for one microfarad was found to be 4,800 degrees. The discharge of the four wires in the first case gave 1,800 degrees, which therefore shows a capacity of .071 microfarads per mile of a single wire. In the second case, when the other wires were all grounded, the deflection was 4,800 degrees, thus giving .188 microfarads per mile of single wire.

The weather was clear and dry, the temperature being moderately warm.

I am pleased to be able to certify to the correctness of these figures, as they are so remarkably good that I should have been inclined to mistrust them had I not been able to satisy myself of their correctness. Yours very truly,

CARL HERING.

Third. By F. W. Griffin.

PHILADELPHIA, Nov. 30, 1887.

David Brooks, Esq., Phila.:

MY DEAR SIR: I beg to say to you that I to-day tested the wires you have recently laid between the Broad street station of the Pennsylvania Railroad Company and their telegraph office at Thirty-second and Market streets, one and one-third miles distance, with the following result:

Constant of galvo. through 1,000,000 (one megohm) with 100 cells of battery, 1,100 divisions. We first tried one, two, three and four wires singly and got no readable deflection; we then attached the lead wire to the four wires combined, still obtained no readable deflection. We then grounded all the remaining wires (forty-nine) and still obtained no sensible deflection, but calling it one division for the four conductors would give an insulation per mile of 5,833 megohms.

We next tested the wires for electro-static capacity: No. 1, with all the other wires grounded, showed a capacity of 0.14 mfds. per mile; gauge of wire No. 18, American.

No. 2, with all other wires grounded, showed 0.18 mfds. per mile; gauge No. 16.

No. 1, with the grounds taken off other wires, showed 0.10 mfds. per mile.

No. 2, with the ground taken off all other wires, showed 0.13 mfds. per mile.

Temperature above ground, 35 degrees; underground, 60 degrees.

Two-thirds of the pipe is hung under the track of elevated road. The balance is laid beneath the ditch in West Philadelphia.

I beg to congratulate you on the remarkable showing in this test, which I believe is the first experiment with your process, patented Feb. 1, 1887.

These tests were made in the presence of Mr. Fowle, of the Pennsylvania Railroad Company; Mr. John K. Butler, of the American Telephone and Telegraph company.

Yours truly, F. W. GRIFFIN.

The following letters refer to the durability of the insulating material:

In my opinion, the compound of rosin and rosin oil which Mr. Brooks uses as an insulating material, when enclosed in a tube, or otherwise protected from the action of the air, is unchangeable as to the characteristics upon which its insulating power depends.

CHARLES M. CRESSON, M. D.

PHILADELPHIA, Dec. 3, 1887.

David Brooks, Esq.:

DEAR SIR: In answer to your inquiry in regard to the quality of rosin oil after a period of time, I beg to state that after a long experience in making rosin oil, I find that the quality is much improved by age. Either in bottles, barrels, or vessels of any kind, the oil becomes richer and softer, similar to most other distilled liquids.

Yours truly,

EDW. H. ROWLEY,

of Edw. H. Rowley & Son, Distillers of Rosin Oil.

P. S.—It becomes less liquid in low temperatures, but never congeals or becomes solid.

NEW YORK, Dec. 3, 1887.

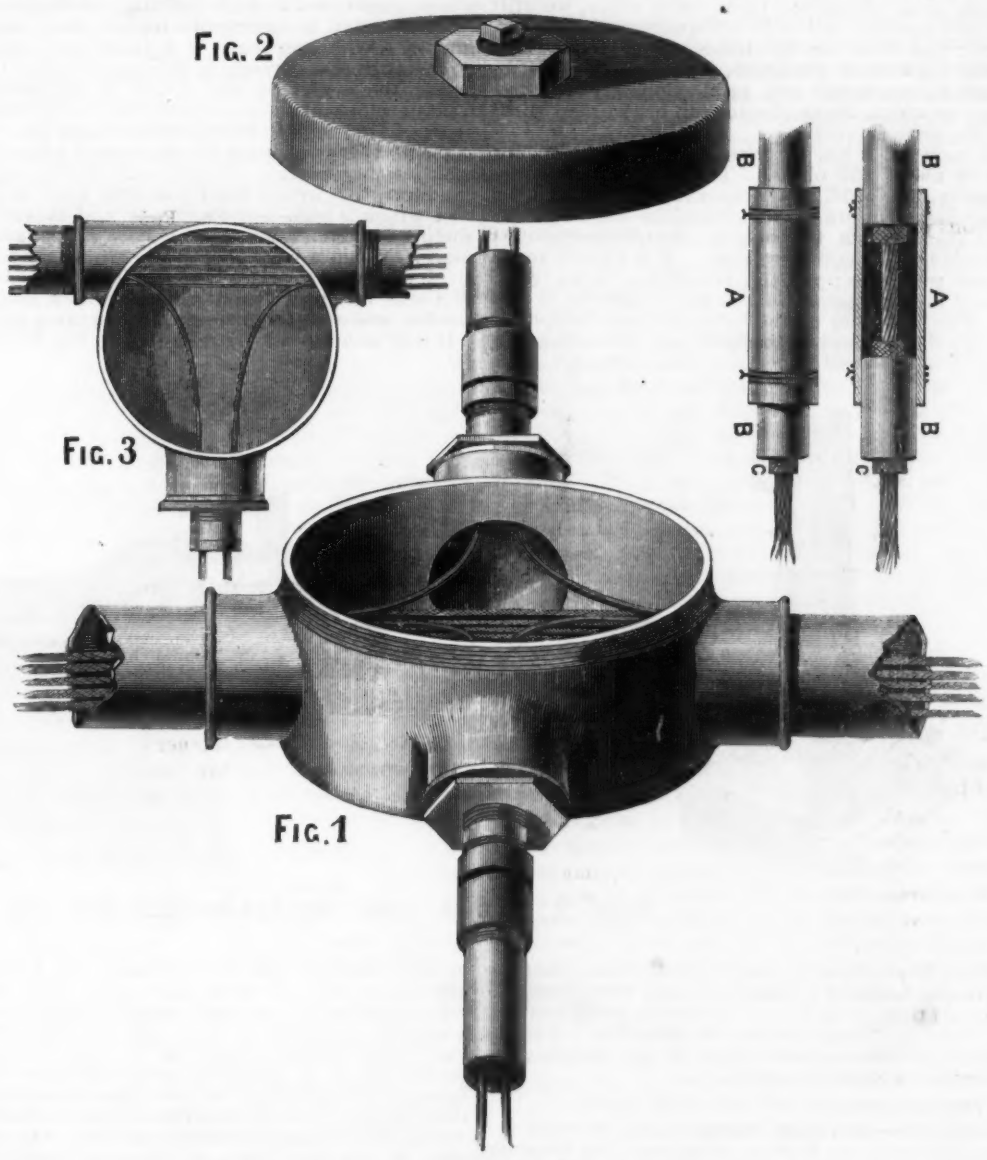
Mr. David Brooks, Philadelphia, Pa.:

DEAR SIR: Replying to your favor of 2d inst., inquiring "whether our 'London oil' undergoes any change in barrels or any other vessel, corked or sealed, except to be less fluid in cold weather or low temperature, and also how long it will last without undergoing any change," I beg to inform you the "London Oil" will not deteriorate on account of time, and holds its adhesive properties and gravity for years without any change, except in cold weather, when it becomes much thicker, otherwise the quality of the oil remains the same. Yours truly,

JOHN A. CASEY.

It will be observed that a No. 16 gauge wire has about forty per cent. greater electro-static capacity than a wire of No. 18 gauge, but the surface of the No. 16 is only twenty-seven per cent. greater. A thirty conductor cable of the same No. 18 gauge with one winding for each wire, insulated with oil, gave .4 for capacity, but as this No. 18 has two windings, and all the other wires two windings, it appears that the electro-static capacity is a little more than one-third of the amount, when but one winding is used upon each wire. Again, if all the other wires in the cable had been No. 18 gauge, the electro-static capacity of No. 1 would have been still less, or something in the neighborhood of one-third of what it would have been if each wire had but one winding of cotton. Now, suppose we put on four windings or two windings of double thickness each, and use No. 18 American gauge for a conductor, then we would reduce the electro-static capacity to something like .07; quite probably less. Electro-static capacity is directly in proportion to the extent of the surfaces of the conductors and in inverse ratio to their distances from each other. In practice it appears that when it should be one-fourth, according to the laws of electro-statics, it is really only one-sixth or less.

The conductors in a gutta percha or india rubber cable suspended in the air are much more affected by inductive disturbance than when the same cable is drawn into a lead or iron pipe. The reason of this is that the inductive effects are distributed, a large portion being divided between the pipe and other conductors; and the same applies to wires strung upon poles, although they are thousands of times further separated than when grouped into a cable. The inductive affects are not decreased in that proportion simply because there is no other conductor besides the wires to receive its effects. When the conductors are in metal pipe, which may be further away from them than



THE NEW BROOKS UNDERGROUND SYSTEM.

the average of the other conductors, the pipe receives a very large portion of the disturbing effects on account of its greater size and surface, and it is quite probable that when the pipe is buried in the earth, the earth itself would tend to increase the tendency of the pipe to diminish the disturbing annoyance upon the other wires.

Some of the European electricians contend that the resistance of a conductor, when multiplied by its electrostatic capacity, gives a product which is a direct measure of retardation. It is a more direct measure of the capacity of the conductor to develop disturbing elements, such as cross talk and disagreeable rattling.

The difference in conductivity between a conductor of No. 14 gauge in a length of line say of ten miles, and that of a No. 20 gauge when used for telephone purposes, is not appreciable by any means that I can suggest. By placing one of the telephone receivers near a clock at Broad Street Station, and using the No. 18 gauge conductor with another telephone a mile and one-third distant in West Philadelphia, the tick of the clock is distinctly heard in West Philadelphia; substituting the entire fifty-three conductors, the person listening cannot distinguish any increased sound in the telephone receiver, although the conductor in the latter case has at least seventy-five times less resistance. In this experiment of using one wire for a conductor and the entire fifty-three in comparison, the iron pipe was used for the return circuit, and no rattling disturbance was observed in either case.

To make a telephone circuit as free as possible from inductive disturbance, we should separate the wires as far as possible. If we reduce the circumference of the conductors one-half, we reduce the disturbance by one-half; if we double their distances from each other, we still further reduce another half or to one quarter of its original amount; and if we can by these means reduce the electro-static capacity to one-tenth, we reduce the disturbing elements to one-tenth and proportionately increase the distance to which the conductor can be worked without annoying disturbances.

The resistance of a No. 18 wire, American gauge, for ten miles is about 350 ohms. The resistance of two hundred miles of No. 18, American gauge, is about 7,000 ohms; the latter figure is something in the neighborhood of the resistance of the metallic circuit as employed between Philadelphia and New York. It is twenty times greater than ten miles; yet the telephones work well, showing that low resistance in telephone circuits is not essential. The operators of the Long Distance Telephone Company say they cannot distinguish any advantage in the use of No. 12 gauge over that of No. 18 in working the metallic circuits between Philadelphia and New York. If so, it is certain there is little to be gained in using a larger conductor than No. 20 on circuits not exceeding ten miles in length, but, as before stated, there is an advantage in an electro-static or inductive sense.

THE ADVANTAGES OF IRON OVER LEAD.

An iron pipe two inches in diameter costs no more per foot than a lead pipe one inch in diameter. The capacity of the iron pipe is four times that of the lead pipe, and consequently can contain four times as many conductors of equal gauge and insulation. Now, suppose we put one hundred wires of equal gauge in the lead pipe and one hundred in the iron pipe, the latter insulated to four times the thickness, it follows that we can work the wires in the iron pipe with one-quarter the inductive disturbance that would exist provided the lead pipe was used. Alfred F. Moore quotes a hundred wire cable, No. 20 gauge, one winding for each wire, at 21 cents per foot, with four windings at 29 cents per foot. The latter cable has less than one-fourth the inductive disturbance of the former, but you can put a cable containing four hundred wires in the iron pipe, if it is desirable, and have them work as well as the one hundred wires in the lead pipe. The greater strength of iron over lead makes it preferable in making the cable secure from injury. Splicing of the conductors is much more readily performed. There is abundance of room in the splice boxes for splicing, and no soldering is needed.

ELECTRIC LIGHTING.

Fig. 1 shows a splice-box twelve inches inside diameter. Fig. 2 shows the lid which screws on over the box. In the centre of the lid is a hole one inch in diameter, closed by a screw plug. Through this opening the melted insulating material is introduced. The side outlets are made to fit a three and a half inch diameter pipe, but can be adapted to pipes of smaller diameter by the use of a bushing as shown on the lateral sides of Fig. 1, where two wires are brought out to bring lamps into service. The capacity of a three and a half inch pipe is sufficient for forty No. 4 gauge electric light conductors. Moore quotes a strand conductor equal to No. 4 at four cents per foot. For that kind of a conductor encased in lead one of the electric light companies of this city shows bills where it pays nine and four-tenth cents per foot. At that rate forty conductors encased in lead would cost three dollars and seventy-six cents, while the copper alone costs one dollar and sixty cents, showing the lead itself to cost two dollars and sixteen cents for the forty feet. The Allison Manufacturing Company quotes three and a half inch pipe at thirty-two cents per foot, showing a saving of one dollar and eighty-four cents per foot where iron is used instead of lead. Sixty conductors are as many as are now used by any single plant in this city, but where the number exceeds forty, two pipes could be laid; but this number diminishes as you leave the station where the power is applied to the dynamos. Where a smaller number of conductors is employed a pipe of less diameter can be used with diminished cost per foot of pipe. But there are other circumstances which reduce the cost. The entire group of conductors can be drawn into the iron pipe by one operation, whereas there has to be an operation of that nature for each conductor when lead is used.

There has been considerable work done Phladelphia within the past few months in laying electrical conductors for incandescent electrical lighting. The conductors were drawn into each length, of about twenty feet of pipe, and the pipe then filled with insulating material in the factory, from which it was transported to the place where it was buried in the ground, and the conductors spliced in a cast-iron box at the end of each length of pipe. This system of splicing makes the work tedious and expensive, certainly so much solder in the joints is of no benefit to the conductivity of the conductor, nor is a splice or joint in the insulation anything but detrimental to the insulation.

In this system a hand hole or splice box is only necessary say for every three lengths of pipe to reach every building in the street, and a thousand feet of the conductors can be drawn in at the one operation. It can be readily seen there is an immense margin for economy.

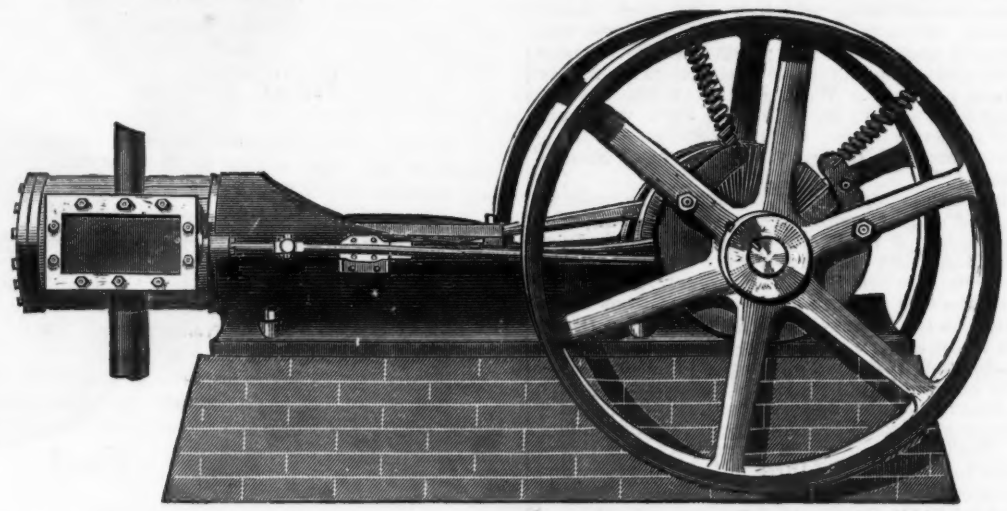
For arc lighting this system has special advantages where currents of so high potential are employed. The insulation itself is specifically higher than anything else known. Wherever there is a fault in the insulation, the tendency of the current is to centre in that fault and increase the defect by the action of the current until the fault develops into perfect earth. (See Culley on the "Treatment of Underground Conductors," page 332, 8th edition); but with this system a different state of affairs exists. As soon as any portion of the insulation becomes weak, or conducts, the current itself produces heat, and the insulation which is semi-liquid expands and moves away, producing a circulation, and a cooler insulation takes its place. When a wire becomes hot or incandescent in the air, it sets the air in motion but it does not burn the air; if it is in water, it vaporizes the water and sets that in motion, and a cooler current of water takes its place.

It will be observed, by reference to Fig. 1, how a loop is brought into the splice box by means of a running screw and a short piece of inch pipe filled with cement. The wires for this loop are lead incased and when brought to a lamp or instrument, have the terminals insulated by cutting out a piece of the lead covering and insulation as shown at *A*, *A*, where a section of lead covering and insulation is removed, and over this space is drawn two or three inches of soft rubber tubing, and bound tightly with twine at each end as shown in the cut. It will be seen that if the insulation *C* becomes sufficiently damp to carry a current from the conductor to the lead covering *B* that it can go no further than the rubber sleeves, otherwise, the current would go to the earth. I notice some one evidently interested in other kinds of insulation, writes in one of the English journals that the tendency of the current to pass from the conductor to the lead is "fatal" to the use of lead encased conductors. All the wires lately laid for the Pennsylvania Railroad are provided with this device, and when we remove any of the wires from the lightning arrester and charge them, they do not fall to one-half their charge in less than an hour. I do not see anything "fatal" in that. Messrs. Tatham & Bros., of this city, have a patent for this device. When this attachment becomes impaired from long exposure to the weather, it can be readily removed and replaced by a fresh piece of rubber tubing. Fig. 3 shows a modification of the hand hole placed at one side of the pipe in order that another pipe can be placed at the side of the pipe entering this box, and by that means when there are a number of pipes in the same box they do not have to be spread apart to make room for the hand hole. This becomes useful when two or more pipes are laid in the same box filled with pitch. For an ordinary telephone or telegraph cable, one thousand feet can be easily drawn into an iron pipe which has been made perfectly smooth inside by a process of scouring. For house to house electric light work these splice boxes, or more properly hand holes, are employed as often as one for every two buildings. The same applies for telephone purposes. Eighteen inches depth is sufficient for the trench. The pipe is inclosed in a wooden trough of sufficient dimensions to admit the pipe sockets, which are something larger than the pipe, leaving sufficient space for pouring in melted pitch, which effectually protects the iron from oxidation. The wooden box is of such small diameter that all the earth taken from the trench can be replaced, and no hauling away of earth is required, which is no small item in construction. In this system no manholes are required; they would be worse than useless. These splice boxes are made of malleable cast iron, and can be reached by removing the paving stones over them as readily as those heavy cast iron covers to the manholes, especially in winter time when they are fastened in their position by ice. These manholes are receptacles for filth, and are prejudicial to health, and continually liable to explosion from gas collecting therein. Wood troughs or boxes were once used in London, but have been entirely abandoned on account of being subject to dry rot and a source of danger from accumulation of gas. (See Mr. Fleetwood's Report, May 26, 1887, *Journal of Society of Telegraph Engineers and Electricians*, Vol. 16, page 413.) By this system five hundred telephone or telegraph wires can be drawn into a three-inch pipe, and the pipe can be warped either above or below, to the right or to the left of any obstruction you meet, and if you give the pipe a bend of a two-foot radius it can be drawn around a corner at right angles. Ordinary conduits have to be laid straight. I am not posted as to their expense, but I know sufficient to affirm that I can lay by this system more conductors of equal size and better insulation than can be drawn into the conduits for less money than the conduits cost without any wires in them. I will lay those on one side of the conduit itself. Another view of the case; I will take the other side of the conduit and lay more wires than they can get into their conduit, wires of equal conductivity and better insulation for less money than they can put them into their conduit after it is laid.

A conduit, of all the things in the world, is the worst place to put wires except a fire itself; they are filled with ammoniacal gases from the sewers, and gas from the street mains so combined with moisture that disintegration and decay attack anything that is put in them.

This system laid for the Penn-sylvania Railroad was done by men who never had any previous experience in underground work for electrical purposes of any kind. I have not the entire items of expense. The pipe cost 14½ cents per foot, the cable cost 20 cents per foot, but I am told by the engineer in charge that the cost of that portion west of the Schuylkill River completed in every way, cost less than that number of iron wires of equal conductivity upon poles, of which the company has ample experience. The portion on the east side of the river is suspended from the frame work of the elevated railroad, and would cost considerably less than where trenching is necessary. In a city where the streets are paved the cost of trenching and repaving is offset when poles and wires are used by a more sightly and expensive set of poles, and the cost of trenching outside of the city limits or along side of the steam railway tracks, where as many as from thirty to fifty wires are used, makes it in such localities cheaper to put the wires underground.

It was not the intention of the Pennsylvania Railroad Company to use these wires for telephone purposes. Fifteen telegraph conductors have been connected into the cable, and some of those conductors are operated with one hundred and thirty cells of battery at Broad Street Station in connection with dynamo currents at Jersey City. After all the telegraph conductors had been connected and working, some of the telephone circuits were connected in the cable experimentally, and those who use the telephones say they observed a marked improvement; and with these results all the telephone circuits are now brought through this cable, and each party using telephones makes the same favorable report. It should be borne in mind that they were previously in a special cable used for telephone purposes only, and although the rattle caused by the telegraph is observed, speech itself comes much more distinctly articulated.



FIGS. 1 AND 2.—THE WILLIAMS ENGINE FOR ELECTRIC LIGHTING.

A Southern Engine for Electric Lighting.

The illustrations on this page, Figs. 1 and 2, show an engine which is, it is believed, the first built in the South for electric lighting purposes. The manufacturer is the Williams Engine Company of Baltimore. This engine is solid and substantial, as will be seen. All its parts are easily got at, and are as few in number as possible. The governor contains but three pieces—two weights and an eccentric—so connected as to work through its entire range from zero to three-quarter stroke without changing the lead in the slightest. An important feature of the governor is that its bearings, like all those on the engine, can be oiled while running.

The valve is a flat plate with a pressure plate on top. The steam is inside the valve and plate, which it tends to push down on the valve. A set screw adjustable from the outside keeps the plate in position. The valve is perfectly balanced in all positions, and if worn so as to require adjustment, can be attended to while the engine is running. The piston packing used is of the company's own make. It is said to be very durable and will keep

steam tight a long while. The engines are built from 6 h. p. up.

Mr. S. T. Williams reports some excellent tests with engines of this make, including one with a Sawyer-Man 50-light plant in which the engine of 8 h. p., running 350 revolutions per minute, with a boiler pressure of 70 lbs., regulated with the greatest closeness, even when 49 out of the 50 lights were thrown on or off in a body.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
168-177 POTTER BUILDING, NEW YORK, Jan. 16, 1888.

The Bucket Shop War.

"The Open Board Clearing House" was incorporated last week with a capital of $10,000. The incorporators are Louis L. Todd, Elliott W. Todd, Charles H. Garland, Edward F. Hibbard and Wilbur F. Hubbell. Elliott W. Todd, who was lately convicted for violating the gambling law by running a bucket shop, is the chief projector of this new scheme, by which, his lawyers assure him, the law against gambling may be dodged. De Lancey Nicoll and Ambrose H. Purdy, the lawyers who have been in trusted with the Stock Exchange's campaign, which is backed by a fund of $10,000, against the bucket shops, have already gone to work on the cases prepared for them. It is stated that over 40 bucket shops in this State have been "spotted" by Stock Exchange detectives, evidence having been collected both by men and women. Mr. Nicoll has no doubt that aggressive prosecution will result in the extermination of the bucket shop nuisance speedily.

Wires on the Stock Exchange.

In this connection may be mentioned the resolve of the Stock Exchange to prevent any running of telephone or telegraph wires between its own building and the new rival Consolidated Exchange near by.

Electric Time in Brooklyn.

The Electric Time Company, of Brooklyn, R. C. Peabody, Treasurer, with offices in the Garfield Building, has been doing quite an extensive business in isolated plants for time distribution, especially in schools. It has wired some five or six of the public schools and is now working on three or four of the new school buildings. The clocks in the various departments are kept in unison by a regulator in the principal room, so that uniform time is furnished throughout the building. The company has also been busy in fitting up tower clocks in various parts of the country, as, for example, at Hoboken, which has a complete system in its City Hall.

Awards to the Union Indurated Fibre Company.

As a summary of their work during the season of 1887, in competitive exhibition with other lines of goods, the Union Indurated Fibre Company report the following recognition: Award of merit (highest award), American Exhibition, London; silver medal (highest award), Mechanics' Institute Fair, Boston, Mass.; medal of superiority (highest award), American Institute, New York; silver medal (highest award), Fair of New Jersey Agricultural Society; bronze medal and first premium, Burlington County, N. J., Agricultural Fair; first premium with diploma from the following exhibitions: Maine State Fair, Bangor, Me.; Vermont State Fair, Burlington, Vt.; Pennsylvania State Fair, Philadelphia, Pa.; Ohio State Fair, Columbus, O.; Georgia State Fair, Macon, Ga.; Piedmont Exhibition, Atlanta, Ga Such marked recognition from so varied a territory but demonstrates how readily the merits of this ware are appreciated.

The New York Safety Steam Power Company

has just issued a list or report of its installations of engines, etc., for electric lighting plants. It is an imposing exhibit of good work, and one of which Mr. E. T. Copeland, the general agent, should feel very proud. As is well-known, the company's automatic cut-off high-speed engine is built specially with a view to meeting the onerous requirements in close regulation, etc., of electric lighting, and its success in this field is a convincing sign of excellence and superiority. The sales run up into thousands of horse-power, and I notice that the same local companies come back for the third and fourth time for additional engines, as their business grows. All the prominent lighting systems are included and well represented in the list: Edison, Brush, Thomson-Houston, Westinghouse, American, United States, Jenney, Schuyler, etc. Aside from its business bearing, the list is interesting as illustrative of electric lighting development.

The Hussey Patent Reheater.

I suppose it isn't too much to ask an electric light man to study economy, nor gratuitous impertinence to call his attention to ways in which he can increase the earning capacity of his plant. An economical device now attracting attention in connection with steam plants is the Hussey patent reheater for reheating exhaust steam, superheating live steam and heating air, without extra cost of fuel. The reheater is placed in the flue, or an extension thereof, in order to utilize the heat of the gases after they have left the boiler tubes, and at the same time not interfere with the draught. The exhaust steam passes through the reheater, while the gases, on their way to the chimney, pass around the reheater, and since the temperature of the gases is higher than the temperature of the steam, the steam naturally rises in temperature, so that the exhaust steam reheated becomes as valuable as live steam for all purposes except power. In every case the reheater adapts itself to the setting of the boilers. For instance, it is sometimes placed between the boilers, and at others on top of the boilers. Now electric lighting companies are eminently in a position to utilize such a device, and sell the hot steam for boiling, heating and drying purposes. Mr. S. D. Brewer, 15 Cortlandt street, will furnish circulars and information on this subject.

The Baxter Motor.

The Baxter Electric Manufacturing and Motor Company, but recently settled in New York, has made a great reputation for its motors in this city as one of the most convenient substitutes for steam and other power. It has just installed a motor for A. D. Julliard, vice-president of the Brush Illuminating Company, New York, in his new warehouse, 26 Laight street, where it is running two large freight elevators (hydraulic) of 2,500 lbs. capacity each with perfect satisfaction. Messrs. Munn & Co., proprietors of the *Scientific American*, after fully canvassing the merits of other powers and motors, decided to put in a Baxter electric motor, which is now running a large exhaust fan to remove foul air from their spacious establishment on Broadway. Messrs. Liebman Bros. & Owings, of the magnificent "Universal," in Brooklyn, N. Y., have been using one of the Baxter motors for two or three months, running three elevators from a pressure tank, and have given the Baxter Company a letter highly commending their motor. Mr. Julliard, I may add, proposes to introduce this power in two other of his warehouses, and Mr. Coubray, the manager for New York, reports a number of orders for the near future. The company is now "at home" in its new quarters, rooms 347, 348 and 349 in the Potter Building, where it has fitted up the rooms in elegant style, and will be pleased to receive calls from all interested in electric power and its applications.

The Brush Electric Company.

The roomy quarters of the Brush Electric Company at 36 Union Square have already assumed a business-like look, and work there goes on steadily. The quiet, good taste shown in the decorations and equipment cannot be too highly commended, and yet one feels that the result obtained is meant to give comfort and was not aimed at for mere effect. Mr. W. F. Swift, who is directing affairs there, informs me that the outlook for new work during 1888 is remarkably good. One of the large installations just contracted for is a 500-light incandescent plant for the new barb wire fence works of Washburn & Moen, at Worcester. Mr. Swift regards the motor field as very promising, and calls attention to some strong encomiums of the Brush motor, quoted in the motor catalogue of the company.

An Automatic Self-Winding Weight Clock.

Mr. Vitalis Himmer, the successor to the Standard Electric Clock Company, 62 Reade street, is introducing his automatic self-winding weight clock. This clock winds itself every minute, step by step. If fully wound, it then disconnects the battery automatically and runs until the weight reaches a certain point, when the battery again is thrown automatically into circuit, and the clock is once more rewound. This system is of wide application, and is a good supplement to clock-winders with short memories.

The Julien Traction Company.

Articles of incorporation of the Julien Electric Company were recorded in the County Clerk's office last week. The capital is $3,000,000, and the incorporators are William Bracken and L. Willoughby, of Philadelphia, and Edward O. Coles, of East Orange. The new firm will manufacture electrical appliances and build machinery for electrical railways. The plant will be centred in East Orange.

Miscellaneous.

Charles A. Schieren & Co. report sales of leather link belting during the past week to the following concerns for use on dynamos: Nashua Electric Light Company, Nashua, N. H.; South Framingham Electric Light Company, South Framingham, Mass.; Edison Electric Illuminating Company, New Orleans, La.

Mr. A. F. Toovey, of the French Atlantic Cable Company, at Cape Cod, reports of the P. & B. compound that it has proved much more effective as an insulating substance for electrical apparatus than shellac. It is not affected by dampness or atmospheric changes, and thus must be of great value in places where a highly resisting medium is required for insulation. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
48 Congress Street, Boston, Jan. 16, 1888.

Personals.

Mr. S. A. Barton, the general manager of the Thomson-Houston Electric Company, who has for some time past been residing in Chicago and looking after the interests of his company in the West, was on a few days' visit to this city last week.

Mr. J. E. Powell, of Washington, D. C., the inspector of electric lights under the United States Treasury Department, was in this city last week engaged on important business in connection with his department.

The Mansfield Electric Company.

The Mansfield Electric Company, until recently located at Mansfield, Mass., has removed its factory to this city, having secured commodious quarters at No. 383 Federal street.

Electric Lighting in Chelsea.

The Massachusetts Gas Commissioners have made a decision on the petition of the Chelsea Gaslight Company, authorizing them to engage in the business of generating and furnishing electric light and power and prescribe a minimum of fifty horse-power and dynamo power sufficient to convert the same into electricity.

Thomson-Houston Co.'s New Factory.

The Lynn, Mass., *Daily Item*, Jan. 5, contains the following: The Thomson-Houston Electric Light Company, to accommodate its ever-increasing business, has completed the three-story brick building on Centre street, and is now putting in a lot of new machinery. The principal entrance from Centre street leads directly into the main machine room, in size 200 by 60 feet. In this room it is proposed to do most of the heavy machine work. On the right of this room is the engine room, containing a magnificent improved Green double engine of 500 horse-power, having a pair of cylinders 20x42. The flywheel is 20 feet in diameter, and 38-inch face. In the boiler room adjoining are four 125 horse-power Cunningham boilers.

On the same floor is an elevator made by the Whittier Machine Company, of Boston, and having a capacity of 8,000 pounds. Two traveling cranes will do all the lifting, and be so arranged that the centre of the main floor, the whole length of the building, will be used for assembling purposes. The second floor, which is also one huge room, is to be used for the testing of alternating currents, dynamos and motors, and for winding the same, also for testing railway and stationary motors and transformers. On the left of this floor the main line of five-inch shafting is placed, and arrangements will be made so that any part of the shafting can be stopped without interfering with the running of the part used for testing. Fine sanitary conveniences are provided on this floor, the water for which is pumped up into large tanks in the tower. A great feature of this building is the towers, in which are situated the staircases connecting the different stories. By the location of these staircases every inch of room is made available for manufacturing purposes. The use to which the third story will be put has not yet been definitely decided upon. The roof of the building is covered with asphalt. The large brick chimney from the boiler is 100 feet high, and 10 square feet at the base. Further down the street is a large two-story storehouse and basement, 130 by 55, where no end of material used all through the main buildings is very systematically arranged, and whence a great quantity of the heavy goods are shipped. The next building is the one used for the manufacture of the Thomson Welding Company's machines. These machines are already getting a world-wide reputation, used as they are for welding all kinds of metals by electricity. A fine Ball engine, of 60 horse-power, making 275 revolutions, supplies the power for planer, drills and lathes. In this building parts of the transformer are made for the company.

The Rogers Auxiliary Fire Alarm.

This system is making steady progress, as I have always predicted would be the case with such a remarkably useful invention. A public exhibition of the Rogers system was given at the headquarters of the Fire Department in the City Hall, New Haven, Conn., a few days ago, and excited the same warm commendation that invariably follows the display of its protective value. I understand that the Boston Auxiliary Fire Alarm Company have made arrangements to install the Rogers system in Young's Hotel, the Sherman House and several other of the larger hotels very shortly, while the Providence Company have just put the Rogers alarm in the Butler Exchange (the largest office building in Providence), with twenty-one stations, and have orders in hand to equip all the stables and shops of the Union Railroad Company, the Narragansett Hotel, Providence Opera House, Westminster Musée, and other leading public buildings. The Rogers alarm has evidently "come to stay."

Electricity Discussed at a Boston Club.

The Merchants' Club, of Boston, had its regular monthly dinner at the Parker House, on Thursday evening Jan. 12. It proved one of the most interesting and enjoyable occasions of the kind ever experienced by the members of that club. Several prominent electricians were among the guests, and those gentlemen entertained the members of the club with a first-class discussion on "the present and possible uses of electricity." Among those who took part in the discussion were, viz.: President E. H. Johnson, of the Edison Electric Light Company of New York; Prof. Charles R. Cross, of the Massachusetts Institute of Technology; Mr. C. A. Coffin, Vice-President and Treasurer of the Thomson-Houston Electric Company; Dr. Clarence J. Blake, the well-known inventor of the "Blake" transmitter; Prof. W. W. Jacques, one of the electrical experts of the American Bell Telephone Company; Mr. Henry M. Whitney, President of the "West End" Railroad Company of Boston, and Mr. J. H. Benton of the parent Edison Company.

Installations of Accumulators.

Mr. John T. Moriarty, the New England representative of the Electrical Accumulator Company, reports having on hand the following orders for storage batteries, some of which have already been filled, while the others will be in readiness for the purposes intended in a short time. These are: One set for use on the new wharf of the Savannah Steamship Company, at Boston, for illuminating the premises at night while vessels are being unloaded; a sufficient number of accumulators for the energizing of sixty (16 c. p.) incandescent lights at the building of the Bunker Hill Cyclorama Association on Columbus avenue, Boston; a small set of storage batteries for lighting the premises of Messrs. Geo. H. Thurston & Co., electrical engineers, Providence, R. I., and 52 of the largest type of accumulators for 80 (16 c. p.) incandescent lights at the factory of the American Rubber Company, East Cambridge, Mass.

The Martha's Vineyard Cable.

In accordance with a vote passed by the Boston Chamber of Commerce on Monday, Jan. 9, a petition was drawn up and sent to Washington the following day in favor of the appropriation for a new submarine cable connecting Martha's Vineyard with the mainland.

Catching a Milk Thief by Electricity.

The Boston *Herald* tells the following story:

One of the members of the police force of this city is a thorough electrician, and when off duty is constantly experimenting with captive lightning. He has his residence at the South end wired from attic to cellar, and makes the electric fluid do all that it is capable of therein. For the last few days his milk has been stolen, can and all. He made up his mind that the thief must be captured, and called to his aid his favorite electrical appliances. The milkman had been in the habit of leaving the lacteal fluid on a little shelf beside the rear door of the house. In order to reach this door it was necessary to pass by the front entrance and go down an alleyway some fifty feet long. Mr. Electrician went to work and connected his wires with the shelf, so arranging the circuit that the removal of the can from its receptacle would strike a gong in the dining-room. Yesterday morning he went home early and took up his position under the gong. Soon he heard the milkman stop and leave the can in its place. He waited patiently for further developments, and just as he was dropping into a doze, zip! whir-r-r! went the gong over his head. To spring from his chair and dart for the front door was but the work of a second, and he landed on the sidewalk at the alleyway entrance in season to nab the marauder, who was coming out with the can in his grasp. He did not take him into custody, but it is fair to assume that there was not dust enough left in the fellow's coat to cause irritation in a midget's optic. The fellow will probably not attempt to purloin that officer's milk for some time to come.

A Thomson-Houston Banquet at Lynn.

The first annual banquet of the foremen and assistants in the big factory of the Thomson-Houston Company, at Lynn, was held at the Boscobel Hotel in Lynn, on Tuesday evening, Jan. 3. It was a most enjoyable and successful affair. There are over 60 of these directors of work in the various departments, their names being: G. H. Alton, I. F. Baker, H. B. Barton, J. C. Berry,

S. Berry, E. E. Boyer, M. H. Branin, E. S. Breed, O. W. Brooking, H. D. Burnett, A. H. Carsley, S. Deacon, G. W, Demmick, A. A. Dennett, A. Ekstrom, G. E. Emmons, A. Fisher, J. Foulds, Jr., W. Foulds, J. Gossner, D. M. Barton, C. Barron, J. R. Cleland, A. B. Corrin, C. A. Cowles, G. F. Curtiss, A. P. Davis, E. F. Davis, S. E. Doane, C. W. Grant, E. H. Howe, W. L. Guernsey, E. D. Hodsdon, W. Leahy, F. F. Libby, A. S. Lord, Z. Lord, Jos. Mitchell, C. M. Morey, J. E. Randall, S. A. Rich, J. Riddell, C. W. Roberts, A. L. Rohrer, H. A. Sawyer, G. E. Stebbins, L. S. Urquhart, J. R. Viets, Jr., W. O. Wakefield, F. W. Webster, E. W. Whitmore, A. W. P. White, W. S. Hadaway, J. R. Johnson, C. A. Learned, Jas. Mitchell, J. L. Nash, G. E. Olsen, W. H. Outtrim, W. H. Parker, J. C. Randlett, E. O. Roberts, H. W. Turner.

The committee of arrangements consisted of Messrs. A. L. Rohrer (the assistant electrician), O. W. Brooking, S. Deacon and A. H. Carsley, the first named presiding. The menu was very tasteful, and besides being compiled in electrical phraseology, was illustrated in tint, with cuts of Thomson-Houston apparatus. One of the speakers mentioned the fact that when he first went to the factory they were turning out four machines a week; now they were producing 40 per week. The banquet was followed the same week by a concert in aid of the Electric Mutual Benefit Association, which, beginning in 1886 with 32 members, now has 192, and is growing rapidly.

A Telegrapher's Just Reward.

A recent issue of the Boston *Daily Globe* has the following: Samuel Mitcheson, telegraph operator in the employ of the Boston & Maine Railroad at West Kennebunk, Me., gathered in a nice sugar plum this morning. It was in the shape of $500 voted him by the directors of the Boston & Maine Railroad. This handsome gratuity was given to Mr. Mitcheson for services rendered by him in saving life and property at Salmon Falls, N. H., last summer. Mr. Mitcheson is a young man and a cripple. Last summer he was at Rollinsford learning operating, and living at Salmon Falls, of which place he is a native. One day in passing down the track near the railroad station he noticed that a switch on the main track was misplaced. Knowing that an express train was about due, he went to the station and reported the fact that the switch was wrong. There was no one visible but a young lady telegrapher, who was not posted in that kind of switches, and was, therefore, powerless. Recognizing the necessity for immediate action, Mr. Mitcheson hobbled back and replaced the switch where it belonged. The heavy passenger train passed a few moments later in safety, and probably not one in 25 of the passengers on it ever knew how close they had come to being participants in a general smash-up It was the consideration of these facts which determined the railroad officials to reward Mr. Mitcheson, whose observing eye and prompt action undoubtedly averted a serious catastrophe.

The Boston Electric Club Dinner.

The first dinner of the club this year was held at its rooms, No. 66 Boylston street, on the evening of Jan. 14. About sixty gentlemen were present, including the most prominent members of the club except its popular president, Mr. P. H. Alexander, who is at present in the South. The most entertaining feature of the evening was the reading of a paper entitled "Electrical Transmission of Energy," by Mr. Edward Blake, of the firm of Sawyer & Blake, New England agents of the Sprague Electric Railway and Motor Company, of New York. This paper was read immediately after the dinner and was followed by a spirited and interesting discussion relating to the numerous instructive points set forth in Mr. Blake's paper. The discussion was participated in by Prof. Elihu Thomson, Mr. E. W. Rice, Jr., and Mr. A. L. Rohrer of the Thomson-Houston Electric Company; Col. E. H. Nevins, of the New England Weston Electric Light Company; ex-President Ridlon, Mr. John C. Wilson and others.

Insulating Thread.

The W. Warren Thread Works, of Westfield, Mass., have just put in four new patent machines for insulating thread used in covering electric wires. Also a 75 Mather light plant, running to 12 o'clock at night, driven by water power.

Telephone Stocks.

In the financial column of the Boston *Sunday Herald*, Jan. 15, I noted the following interesting reference to sales of American Bell telephone stocks, and quotations on various telephone stocks:

Bell telephone rose 3 to 215 for a lot of 10 shares. An order for 100 shares yesterday could be but partially filled at the limit 212, and the fact is there is little stock offered. The stock moves little save when there is a short interest being covered. A decision at Washington is looked for this month, some say the 16th others the 23d and others the 30th.

The following quotations of telephone stocks (presumably nominal) are taken from a New York paper and will be of interest hereabouts:

	Bid.	Asked.		Bid.	Asked.
American Bell.	210	217	Metropolitan	....	....
American Speaking.....	100	....	New England....	40	....
Currier Telephone	2	5	New York & New Jersey	90	95½
Columbia & Panama	....	....	New York & Pennsylvania (par 100).....	95	100
Dolbear..... ...	5	10	Overland..	1	3
Erie.....	30	32	Peoples.	2	....
East Tennessee..		325	Selonoid	1⅛	¾
Globe.....	....	....	Southern Bell		175
Hudson River ...	60	65	Sunderland	4	5
Inter-Continental	⅛	....	Tropical.....	⅝	⅞
Mexican	¾	⅛	Wallace.....	9⅛	10
Mexican Central.	....	175			
Molecular.....	1	2			

W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
39 South Tenth Street, Philadelphia, Pa., Jan. 16, 1888.

The People's Passenger Railway Company.

The annual meeting of the People's Passenger Railway Company was held in this city a few days ago, and the subject of a new motor to take the place of horses on the company's extensive system came up in the course of a discussion as to the loss suffered by a reduction of fares from six to five cents, and the urgent need of more rolling stock. Director Carson said after the meeting, speaking of five-cent fares, that, while there was no falling off in the gross receipts, yet the company was a loser by the additional expense entailed from carrying the additional passengers. "And as we are on the eve of a new motor," said he, "the managers think it would be folly to make any great addition to their rolling stock at this time. I think the coming street car motor is electricity, but whatever it shall be, we feel constrained rather to submit for a short time to the crowding of cars and consequent wear upon the stock than to burden the company with expensive betterments that in a very little while may prove to be behind the times."

Miscellaneous.

William H. Terry, an electrician, of 702 Carman street, Camden, died suddenly last week. County Physician Gross held a view and gave a certificate of death from acute congestion of the brain.

The many friends of Messrs. W. B. and C. J. Churchman, of the firm of Churchman & Co., of this city, will be grieved to learn of the death of their mother, which occurred in Europe just before Christmas, and of which they were informed by cable. They have the sympathies af a host of acquaintances. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD.
44 Lakeside Building, Chicago, Jan. 14, 1888.

Lighting the Chicago River.

Mayor Roche in the City Council last week expressed himself as favorably impressed with the way in which the river is lighted by electricity. This is somewhat encouraging to electric light promoters, added to the fact that the crusade against poor gas and big prices goes nobly on. The matter of natural gas and petroleum for heating purposes has received a large amount of attention by the city press, and an infinite number of schemes are being agitated to supply the same.

Natural Gas for Chicago.

Within the year 1888, as one of the local papers remarks, Chicago will have natural gas and crude petroleum on tap in quantity to suit the demand. The gas is certain; the oil is within all reasonable probability. As to gas, reference is not here made to the accidental flow discovered at the Leland Hotel and Cooke's brewery, or to the possible results of experimental borings now being made in several parts of the city, whose value is as yet entirely a matter of conjecture. The statement is based on the fact that both natural gas and oil have been struck at East Chicago, a few miles east of Hammond and just over the Indiana State line, and that preparations to pipe it to Chicago are well under way. Nor does the statement as to gas depend upon the discovery at East Chicago. If the flow at that point does not prove all that present conditions warrant, the active gas wells now in operation in Indiana will be tapped by a pipe line direct from Chicago. The developments of these new industries will naturally have an effect on other lighting interests here.

Forming an Aluminum Trust.

A special dispatch of Jan. 13, from Findlay, O., says: The leading men who are interested in the manufacture of aluminum in the United States will hold a meeting in this city to-morrow to organize a trust to control the manufacture of that metal in this country. Representatives of this industry from Cincinnati, Louisville, Washington City, and East Saginaw reached here this afternoon, and others from New York, Boston, and Trenton, N. J., are expected to-night. The meeting has been kept very quiet, and those interested are not disposed to give out much information, but that the object of the gathering is as above stated is admitted. One of the principal aluminum works in this country is located here, which accounts for the meeting being held in Findlay.

Underground Wires in Cleveland.

At Cleveland, on Jan. 12, the underground wire question was again discussed before the Board of Improvements at a special meeting held for that purpose. All the members of the board were present and nearly all the telephone, telegraph and electric light companies in the city were represented. Mr. Charles Brush, Mr. Possons, Mr. Cook and others of the Brush company were present, Superintendent E. P. Wright represented the Western Union, Mr. J. P. McKinstry represented the telephone company, Mr. F. J. Stafford the Cleveland Electric Light Company. All of these gentlemen were opposed to the passage of the Slater ordinance. On the other side of the question were City Electrician Rebbeck, Councilman Slater and a committee from the board of underwriters composed of Councilman King, Messrs. M. Buchmann, C. A. Muerman, J. P. Stanard and H. F. Canfield. The board was addressed by Mr. McKinstry, Mr. Wright, Mr. Brush and Mr. Possons, all of whom made a forcible presentation of their case. The other side of the question was heard next day.

The Hill Clutch.

In order to better accommodate their increasing Western business, the Hill Clutch Works, of Cleveland, have recently opened an office at No. 28 South Canal street, Chicago. They have also opened an office in Minneapolis, to care for their large trade among the mills in that section. Their general office and works, as is well known, are located at Cleveland, and their general Eastern office is at Cortlandt street, New York. Their customers, whenever visiting these cities, are cordially welcomed to make the offices their headquarters during their stay.

Fun at the Fort Wayne Company's Factory.

The Fort Wayne Jenney Electric Light Company has been engaged in removing the incandescent department into a new brick building 112 by 41 feet, and three stories in height. The older buildings had become inconveniently crowded with machinery and operatives, and the prospective relief to be afforded by this substantial addition to the plant led the employés to suggest its dedication by a grand ball. The affair occurred on the evening of January 5, and it was successful even beyond the anticipations of its promoters. The entire second floor of the new building was converted into a ball room which was brilliantly illuminated by arc lights. Nearly every one of the two hundred and fifty employés was present and as they are almost equally divided in the matter of sex, and many of them are graceful dancers, the ball combined the most necessary social features. A number of the officers and directors of the company with their ladies were among the invited guests and were present.

The programmes were exquisitely printed and contained, besides delicately tinted pictures of the works, the Jenney incandescent lamp, etc., a very ingeniously constructed programme in which electrical nomenclature was wittily used with every dance that was on it.

On the day following the dance the kindness of the officers of the company and of Superintendent Charles S. Hilton and Frederick Schafer was recognized by the employés in a published card of thanks, in which the hope is expressed that the Fort Wayne Jenney Electric Light Company may have need of another new building each year and that they may be present to dance at its dedication. As a matter of fact a second new building may be begun within a few months and so the second grand ball may not have to await another year for its occurrence.

Johnson & Holland.

The firm of Johnson, Holland & Company, agents in this section for the Electrical Accumulator Company of New York, have removed their offices from 227 La Salle street to Rooms 222, 223 and 225 Phœnix Building.

San Antonio, Tex.

A correspondent at San Antonio writes: "This city, which for some time enjoyed the by no means proud distinction of being the only city in the United States of 40,000 inhabitants without the electric light, has at last redeemed itself. The Electric Light and Power Company, of San Antonio, L. S. Berg, president; H. L. Berg, secretary and general manager, recently installed a Thomson-Houston plant, consisting of two 50-light arc dynamos and a 100 h. p. Ball engine and boiler. They do commercial lighting exclusively, and now have 82 lamps under contract. They are putting in a 175 h. p. Reynolds-Corliss engine, and have ordered a 1,800 light alternating incandescent outfit (Westinghouse). The San Antonio Gas Company also decided to do electric lighting a short time since, and have a city contract of 60 lights for the streets. They are now installing a 100-light Brush plant and Ball engine, and will also do commercial lighting. They will put in an incandescent plant very shortly. They have been enjoined by telegraph, telephone and electric light companies from occupying the same side of several streets with plaintiff's wires, both sides of which are already occupied, but they are going ahead rapidly at other points, and will soon be in operation. Quite a legal fight is expected, as the injunctions prevent their placing lights as desired by the city council, who now take a hand in it and delare they shall have the right of way."

Electrical Supply Company.

The Electrical Supply Company are meeting with much success in introducing their new "P and B" weather-proof wire. They have already taken several large orders, and the demand is constantly increasing.

Telephone Stock Quotations.

Col. S. G. Lynch, broker, 146 La Salle street, furnishes quotations upon telephone stock as follows:

Bell of Mo.....	$160@	$165	Iowa Union..... .	$25@	$26
Chicago.....	365@	375	Michigan.....	73@	74
Central Union.....	43@	44	Missouri and Kansas	68@	69
Colorado.....	19@	21	Rocky Mountain Bell	40@	45
Cumberland..... .	62@	65	Wisconsin.....	108@	109
Great Southern....	30@	32			

E. L. P.

ENGLISH NOTES.

LONDON, Jan. 4, 1888.

The State of English Electrical Industries.

The close of the year 1887 finds the electrical industries in this country in a fairly satisfactory condition. The principal firms are in almost all cases well employed, and I hear of several important orders which have been placed within the last few days. Installations for isolated lighting continue to increase in number both in London and in the provinces, and it is particularly satisfactory to note that the quality of the work now being carried out is in the majority of cases of high-class character. The mischief of that has been done in the past in this country by defective workmanship and ineffective engineering is simply incalculable. As regards central station lighting, I have recently given you a résumé of the condition of affairs here, and there is little more to be added at present. In electric traction the past twelve months has seen a wide-spread interest awakened on the part of electric tramway companies. It is but fair to admit that this has been more largely due to the reports of the rapid development of electric traction in America than to the actual work which has been done in this country. Unfortunately it must also be admitted that the results of the twelve months' working of those lines already in existence here has not in some cases proved of a satisfactory character. At Blackpool, owing to the gross neglect of some one or other, Mr. Holroyd Smith's conduit line was placed *hors de combat* for some weeks in the height of the season; and again, on the North Metropolitan Tramway system, where some two miles of line have been worked with accumulators on the Elieson system, the financial results have not been proved to be of a satisfactory character. Nevertheless preparations are being made in several quarters for renewed experiment, and if properly carried out there can be little doubt the results will be of a more cheering character.

Long Distance Telephony.

The system of long distance telephony has undergone great extension during the year. It is true that London still remains with a solitary wire to Brighton, yet in the northern and midland districts all the more important towns, almost without exception, are now placed in communication within a radius of 50 to 100 miles.

Telegraphy in England.

In telegraphy, owing to government monopoly, there is seldom anything new to report. The Delany multiplex instrument continues to give great satisiaction, and its use during the year been extended over several of the most important circuits in the country. The post-office is thoroughly alive to the importance of employing copper wire in preference to iron for high speed circuits, and it is probable that financial consideration alone has hitherto retarded its more rapid adoption.

Electric Lighting at Bradford.

I have just returned from a visit to Bradford, where, as your readers are already aware, the corporation has recently decid

to undertake a scheme for the general distribution of electricity. A central station, however, already exists in the heart of the town, where Messrs. Schmidt, Douglas & Co. have put in a plant representing about 400 horse-power. This plant has been in successful operation for several months and almost the entire block of buildings surrounding the station is lit. So great was the satisfaction given that the company has received a very large number of applications from people in the immediate neighborhood; but owing to the operation of the Electric Lighting Act and the fact that the corporation of Bradford three years ago obtained a "provisional order," it was impossible for the company to carry its wires either under or over any of the streets of the fown without obtaining the consent of the corporation. This consent was refused, even though the company were willing to pay a royalty upon every light so supplied. It is impossible to avoid sympathizing with Messrs. Schmidt, Douglas & Co in the position in which they are placed, the more so, as they had from the beginning contemplated a considerable extension of their system, and had purchased land and commenced the erection of buildings to contain some 5,000 horse-power. Mr. Schmidt gained his practical experience in the United States, and was for a long time connected with a company at Boston, where he is, I believe, well known in electrical circles. It remains, however, to be seen whether the corporation will not eventually find it to their own interest to come to terms with the company.

Stock Tickers Operated by Accumulators.

The Stock Exchange tapes which are supplied by the Exchange Telegraph Company have until recently required the employment of a primary battery of two thousand cells. These have now been replaced by an accumulator supplied by the Electrical Power Storage Company. The total number of cells now used is two hundred and ten, connected seventy in series. As the result of preliminary experiments, in order to ascertain the most suitable type of cell, it has been found desirable to put the plates about double the usual distance apart. This has the effect of reducing polarization, internal leakage and contacts due to particles of scale, etc. The current required is 35 ampères. The cells are charged with a Gramme machine, which is driven by a hydraulic motor supplied from the mains of the water company. The results so far have been of a satisfactory character. Mr. Higgins, the electrician to the company, informs me that in order to prevent the oxidation of the india rubber bands around the plates, he found it extremely useful to place thick slips of glass between the bands and the plates on every side. Since this has been done not a single band has been destroyed.

Telephoning Between England and France.

Paragraphs continue to find their way into the daily papers as to the laying of a telephone cable between London and Paris. Nothing is at present known of the scheme in official circles, but that this will be done sooner or later there can be no doubt. Some six or seven years ago Mr. W. H. Preece succeeded in telephoning with perfect clearness between Dartmouth and the island of Guernsey, a distance of about sixty-five miles. So far as I am at present aware this is the greatest length of submarine cable which has been successfully telephoned over. The National Telephone Company has in Scotland, however, in constant use several submarine cables of seven, eight and nine miles in length which give perfect satisfaction.

The Advantages of Good Arc Carbons.

The importation of American carbons into this country will, I expect, be found a diminishing quantity. The users of arc lights are by this time fully alive to the fact that a cheap carbon is synonymous with flickering, sputtering, chromatic aberration and other evils. I was recently informed that at one central lighting station in this country the difference in price between an American carbon and a German carbon was sufficient to cover the entire wages of the men employed; and, moreover, the company found it to their advantage to employ a carbon of the best quality attainable.

THE TELEGRAPH.

Western Union Bonds.—The report that the Western Union Telegraph Company will issue its 5 per cent. bonds in 60 days, to take up the Mutual Union bonds, is officially confirmed. The matter of the other subsidiary companies is left in abeyance.

Petitions for Government Telegraphs.—It is reported that the petitions for government telegraphs, circulated by the Knights of Labor, are being returned to headquarters in Philadelphia with great numbers of signatures. A million names are expected.

French Cable Affairs.—Count Dillon has announced in Paris that the French Cable Company will appeal against the decision of the Tribunal of Commerce, which awarded heavy damages to the cable pool as the result of the departure of the company from its pooling agreements.

Telegraph Poles Afloat.—Capt. Grant, of the British ship Kildonau, arrived at Baltimore from Georgetown, P. E. I., says that he passed in the Gulf stream several hundred telegraph poles, extending for six miles in lots of a dozen or less. He says they could not have been any portion of the big raft.

The French Cable Company Must Pay.—The tribunal of commerce, Paris, has delivered a judgment ordering the French Cable Company to conform to the conditions of its agreement with the Anglo-American company, and to pay all costs and a certain amount of damages for each day's delay in carrying out the agreement.

An Operator Killed.—A special dispatch from Brunswick, Mo., of Jan. 10, says: "J. C. Talmage shot and killed the night telegraph operator, C. J. Tidd, here at 7:15 o'clock last night. They quarreled on Saturday night over a telegraphic order. The quarrel was renewed on Monday night in the station office. A scuffle ensued, and Tidd got Talmage down. He was punishing him when Talmage drew his revolver and shot Tidd through the heart, killing him almost instantly. Tidd was about 30 years old, and leaves a wife and one child. Talmage is about 20 years old. He was conductor of a freight train on the Omaha branch of the Wabash Western Railroad. He is in the hands of the sheriff."

THE TELEPHONE.

Rochester, N. Y.—A dispatch of Jan. 8 from Rochester says: The telephone "strike," which was begun in this city in November, 1886, because the Bell Telephone Company attempted to change the charge for instruments from a uniform yearly rental to a toll or individual message rate, will probably be settled in the course of another week. A committee of the citizen's association has received a proposition from representatives of the Bell Company by which the latter agrees to charge a uniform yearly rate per instrument of $64 for business places, $54 for professional subscribers and $45 for private houses. The city has been without telephone service for over a year.

Grumbling Subscribers.—Speaking to a reporter recently about telephone troubles, President C. F. Cutler, of the New York & New Jersey Telephone Company, said: "One source of complaint lies in a man's impatience to get a response at once. He does not stop to think that often three connections have to be made before he can get his man. If the line he wants turns out to be in use he will growl because he was not told so at the start, when the operator could not find it out until the connections had been made. One man complained that he could not get his line when he wanted it, and he said that he was not using it himself to any extent. We investigated, and found that he used his line on an average four and a half hours a day, sixty times a day, or 18,000 times a year, costing him only half cent a message, as he paid $90 a year in Brooklyn. Besides, he was a plumber, and the line was used in receiving orders! He was the last man who ought to kick. We have tried to get him to come here, but he does not. Perhaps he has found out what we know about it."

THE ELECTRIC LIGHT.

Brockport, N Y., will enjoy electric lighting.

Cottonwood Falls, Kan., is to have an electric light plant.

Sharon, Pa.—The new company at Sharon has a capital of $20,000.

Ogdensburgh, N. Y.—The gas company has begun the supply of electric light.

St. Louis, Mo.—A United States plant of 100 lights has been put in the Stiful furniture factory.

Webster, Mass.—The Slater Manufacturing Company has put in a plant of 500 incandescents.

Laporte, Ind.—All the cells in the Northern Indiana prison, at Laporte, will be lit by electricity.

Amsterdam, N. Y.—Gardner & Waring are putting a plant of the Loomis incandescent system into their mill.

Greenville, S. C.—It is reported that the Charleston Electric Light Company proposes to put in a plant at Greenville.

Americus, Ga.—It is said that negotiations are now being carried on for the erection of a gas and electric light plant.

Edison Dividend.—The Edison Electric Illuminating Company, of New York, has declared a quarterly dividend of 1 per cent.

Helena, Mont.—Mr. J. H. Andrews, of North Clinton street, Chicago, is interested in the electric light plant that is proposed for Helena.

Warrenton, Va.—New York parties have proposed to the authorities of Warrenton to build water-works and put in an electric light plant.

Hagerstown, Md.—Proposals are now wanted for the electric light plant to be erected at Hagerstown. Inquiries should be addressed to M. L. Funkhouser.

Train Lighting.—The new trains running from New York to Jacksonville, Fla., in thirty hours, are lighted by electricity, and have their own dynamos on board.

Lowell, Mass.—An interruption of the electric light service at Lowell, on Jan. 12, was caused by a fire in the building occupied by the fire department and near the station.

Hampton, Va.—James A. Nagley, of Pittsburgh, Pa., and others, have formed a company to erect an electric light plant and build an electrical railroad from Hampton to Old Point.

Westinghouse Alternating Plants.—The number of local lighting companies using or introducing the alternating system at the beginning of the year was 72, with a total of 125,000 lamps.

Norwalk, Conn.—A destructive blast occurred in a sewer trench at Norwalk on Jan. 12, breaking the gas main and leaving a large part of the town dependent on electricity for its illumination.

Caribou, Me.—The Caribou Electric Light Company has recently purchased a 50 horse-power engine and a 250-light dynamo. Work has been begun in putting up wires and fixtures for the same.

Russian Duties on Platinum.—A cable message from St. Petersburg, of Jan. 11, says: The *Novosil* says that Russia proposes to place an export duty upon platinum of 15 gold rubles per pood.

Knoxville, Tenn.—The new company incorporated by Martin J. Condon, A. A. Arthur and others, to erect an electric light light plant, is the Knoxville Incandescent Electric Light Compeny. The capital stock is $25,000.

Carrabelle, Fla.—The Thomasville, Tallahassee & Gulf Railroad Company has purchased a Brush arc and incandescent electric light plant for use in their extensive saw mills, yards and wharfs, and the streets of Carrabelle.

Frederick, Md.—A report from Frederick says: W. A. Dunn, of Baltimore, and George J. Morse, of New York, representing the American Electric Light Company, are making efforts to organize a stock company to erect an electric light plant.

Salem, O.—Mr. D. L. Davis, of the Salem Electric Light and Power Company, writes: "Our city council has, with one consent, changed from arc to incandescent lighting. We shall put in 330 lights of 25 c. p., which, it is believed, will light the town better and much more evenly than fifty-five 1,200 c. p. lights. The contract price is the same in either case, being $4,000 per year. We shall use the Westinghouse converter system. Whether our plans will be entirely successful, I can better tell after April 1 next."

St. Louis, Mo.—At St. Louis, Jan. 7, the firehouse of the Brush Electric Light Company, at the corner of Seventh and Walnut streets, was damaged about $10,000 by fire, and a large number of lights were temporarily cut off in the business part of the city; fully insured.

Great Barrington, Mass.—Advice from Great Barrington states that an electric light company is to be incorporated to furnish electric lights for the town. The Edison system will be used, and the machinery will be in and wires put up so that the light will be ready to use in the early spring.

Yarmouth, Me.—The Forest Paper Company at Yarmouth has recently set up a Westinghouse engine, to run a powerful dynamo for the purpose of lighting the mill and yard, and to bleach the stock. Nearly 200 lights will be used. The Royal River Manufacturing Company and Weston's machine shop of Yarmouth also are lighted by electricity.

Uniontown, Pa.—The Fayette Electric Light and Power Company, formed at Uniontown, Pa., with a capital stock of $5,000, has the power to increase to $25,000. Mr. J. K. Ritenour is the president, Mr. G. S. Harah treasurer, and Mr. H. L. Robinson secretary. Incandescent lighting will be done, but so far no system has been adopted.

Springfield, Mass.—The Springfield Electric Light Company is having so many calls for incandescent service that it will, doubtless, have to add a fourth dynamo for the plant. The wires are being put up in the Post Office for lights, and it looks as if the contract made months ago is liable to be carried out sometime. The incandescents are on the Westinghouse alternating system.

Schenectady, N. Y.—The Westinghouse local company at Schenectady is shifting its plant, and has already transferred a large part of the load to the new station. It is running about 1,200 to 1,500 lights from the old station on the three-wire system. The new station has a 1,300-light machine, and is putting in two 650-light machines for alternating current work, giving a total capacity of 2,600 lights on the alternating system.

Peterboro, N. H.—The Peterboro *Transcript* of Jan. 5 says: "Joseph Noone's Sons have proved more enterprising than all the rest of our business men, for while the recent attempt to secure an electric light plant for our village has proved a failure, this live firm has put into their mill at the South Village a one hundred and twenty-five light incandescent dynamo, made by E. & T. Fairbanks, of St. Johnsbury, Vt. It has always been the policy of this firm to adopt new methods and machinery the moment that it was demonstrated that they were superior to anything else known, and have often discarded comparatively new and expensive machines simply because they had found something better." The Noone establishment has, it may be mentioned, been in existence since 1831. It has employés who have been 34 and 44 years in its service.

Reading, Pa.—The Reading Electric Light and Power Company have about completed the installation of the new American system of arc lighting. The plant consists of six thirty-five light dynamos and two hundred and ten lamps, with other necessary appliances. The new system replaces eight Arnoux dynamos that have been in use here since the station started. The change has been made on account of the superior brilliancy, steadiness and economy of operation of the new system. The lights are very favorably commented upon by private consumers, city officials and citizens generally. This change will make the Reading station one of the best equipped electric lighting stations in this section of the country. The installation has been made under the supervision of Mr. P. H. Korst, of the American Company.—*Reading Times.*

Manchester, Va.—Situated just on the south side of the river from Richmond is the city of Manchester, Va., with about 10,000 inhabitants, including her suburbs. This growing place, which in the last two years has secured street car connections with Richmond and has in it the plant of the Old Dominion Electric Light and Power Company, which furnishes incandescent lights for the stores and business houses and elegant arc lights where needed, is soon to have gas also. A company, not yet chartered, has been granted permission to establish its works, which will cost $150,000, and to lay its pipe mains, etc. It proposes to furnish a water gas superior to any coal gas, and the price is never to exceed $1 per 1,000 cubit feet to customers and 75 cents to the city. The ultimate hope is to reach Richmond, where the city gas works charge 50 or 60 per cent. more. The light is highly spoken of.—*Progressive Age.*

APPLICATIONS OF POWER.

Galveston, Tex.—Estimates are being received by the Galveston City Railway Company for equipping its road for operation by electricity.

Detroit, Mich.—Arrangements are now nearly completed for the organization of a company and the construction and operation of a Van Depoele electric road between Detroit and Mount Clemens, the seat of the famous mineral springs and quite a famous resort for invalids from all parts of the country. Mr. Willis C. Turner, of the Van Depoele Construction Company, is at the bottom of this enterprise. The length of the projected line is 20 miles. It is proposed to locate a central station about midway between the two terminal points, at which the motive power for the entire system will be generated. There will be three electric motors of 50 h. p. each, a 200 h. p. generator with boiler and engines commensurate, and $20,000 worth of half inch copper wire conductors. It is proposed to have three closed cars, Pullman-built, 30 feet long, and three open cars for summer running, each 40 feet long, with seating capacity for 100 persons. One train will leave Mount Clemens every hour and another Detroit at the same time; and, though stopping at several hamlets en route, it is believed that the round trip can be made in two hours. One train will be held in reserve for excursions or

emergencies. Light freight, baggage, and mail will be carried in addition to passengers. The estimated cost of the entire line, fully equipped, is $250,000.

Easton, Pa.—A trial trip was made at Easton, Pa., on Jan. 12, on the Lafayette Traction Company's electric road, built by the Electric Safety Power Company of New York, and run by the Daft system. The line is a little short of a mile and extends from the lower portion of the city up a steep hill to the northern boundary line. The contract cost complete was $18,000. Heavy steel rails are used. For a portion of the distance the line skirts the side of the road and the overhead wires which conduct the currents of electricity are suspended from short arms leading out from upright poles. Where the track takes the centre of the street the wires are suspended by means of other wires stretched across the street and secured by poles on each side. The chief interest to the electrical world in this road is the steep grade to be overcome and the question whether electricity could carry a car up the grade, which is 9 per cent. for a distance of 1,200 feet. That is, there is a rise of 9 feet in every 100. It would be impracticable for horse cars to be pulled up this grade. The test was entirely satisfactory, as the cars, filled with all who could get inside or hang on, went up the grade with ease, though but two-thirds of the power was employed. The cars seat 12 people. A score can sit and stand. The test was made all the more severe by stopping the car on the grade and starting it again. This was done with ease with the car heavily loaded. Some anxiety was felt about the car descending this steep decline, but it was easily held by the brake, and it was shown that the electric current could be brought into use to assist in controlling the car in the descent.

PERSONALS.

Mr. C. H. Libby writes to the Boston *Manufacturers' Gazette* pointing out the economy of electric lighting as compared with gas.

Mr. F. J. Sprague was in New York this week, and reported great progress with the Richmond Electric Railway, work which he is personally supervising. The road already has about a dozen cars running, and the increase of the equipment is going on as rapidly as possible.

Mr. S. M. Hamill has been elected assistant secretary of the Brush Electric Company. This is a case of promotion for merit, and Mr. Hamill will find increased opportunities of good work in the position to which the growing business of the company has called him. Mr. Hamill's office will be at Cleveland as heretofore.

Mr. T. A. Edison's portrait, in colors, from a photograph taken in the eighties, is the supplement of a recent number of the London *Electrical Engineer*.

Mr. W. H. Baker, so long prominent in telegraph circles, and more latterly engaged in electric lighting and in Wall Street, has become the private secretary of Mr. Theodore N. Vail. In this new position, with its large and varied responsibilities, Mr. Baker enjoys abundant occupation for his well known ability and experience of men and affairs.

Mr. Edward Weston is quoted as saying: "It is well known that the nitrate of amyl possesses the power of causing insensibility very quickly in a human being breathing its fumes. The effect is equivalent temporarily to a paralytic stroke. Now, nitrate of amyl is very cheap and plentiful. I propose to fire shells filled with this chemical instead of gunpowder. It will not be necessary to penetrate a ship. A few gallons of this nitrate dashed on the deck of a war ship would soon render her crew helpless. The most powerful iron-clads would be even more vulnerable than the light cruisers, for they would be sucking down great draughts of air through their artificial ventilators, and the odor would thus rapidly permeate the whole ship. The entire crew being rendered helpless for an hour or two, the ship could, of course, be towed to a safe spot, while the captors ventilated her and removed the insensible men."

MISCELLANEOUS NOTES.

A Theatre Curtain Operated Electrically.—The iron curtain which has just been put into the Théâtre Français, in Paris, is stiffened by braces of iron and decorated by canvas attached to it. It is worked hydraulically, and the valves are arranged so as to be operated by electricity.

An Earthquake in Canada.—A dispatch from Ottawa, of Jan. 11, says: A shock of earthquake was felt throughout the city this morning at 4:50 o'clock. The vibration was quite distinct, and seemed to be traveling westward. It was felt at various points in the Ottawa Valley. Many persons were badly scared. The vibration lasted between five and ten seconds. The shock is described as resembling the rolling of a heavy-laden wagon over a hard road; in many houses crockery and other articles were smashed.

The Michigan Electric Service Company, which was formed recently at Detroit, has a capital stock of $50,000, of which $34,500 is paid in. The officers are: E. W. Neff, president; F. H. Seymour, vice-president, and J. C. Grout, secretary, who are the stockholders. The company proposes to make and sell electric and pneumatic apparatus, and to push the Johnson heat regulating apparatus, which is well known to electricians. The company owns the rights for the State of Michigan, as well as for Lucas County, O., including the city of Toledo. It has already placed the apparatus in some of the finest residences in Detroit.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolt cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

State of New York, County of New York, ss.: We, Erastus Wiman, Eugene G. Blackford, Francis R. Upton and Charles L. Clarke, a majority of the trustees of the Telemeter Company of New York, of which said Erastus Wiman is the President, do hereby certify and declare:

That the capital stock of said company is five hundred thousand dollars:

That five hundred thousand dollars of said capital has been paid in full by patents, patent rights, and by property necessary for the company's business, in payment for which capital stock was issued:

That the existing debts of said company amount, as nearly as can be ascertained, to fifteen hundred dollars.

Witness our hands this 4th day of January, 1888.

ERASTUS WIMAN,
EUGENE G. BLACKFORD,
FRANCIS R. UPTON,
CHAS. L. CLARKE.

STATE OF NEW YORK, COUNTY OF NEW YORK, SS.:

Erastus Wiman, being duly sworn, says that he is President of said Telemeter Company of New York, and that the foregoing annual report is true to the best of his knowledge, information and belief.

ERASTUS WIMAN.

Sworn to before me this 9th day of January, 1888,

JOHN J. WARD,
Notary Public, Kings Co., New York.

Certificate filed in New York Co.

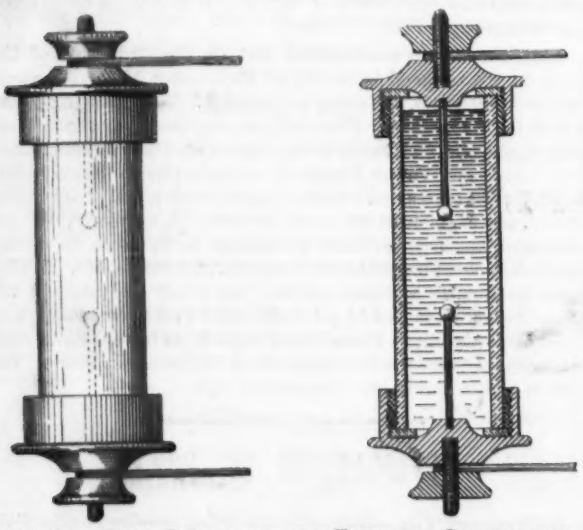
OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JANUARY 10, 1888

376,060. Telephonic Transmitter; S. E. Beedy, Farmington, Maine, Assignor of one-fourth to D. W. Austin and J. J. Linscott, same place. Application filed Aug. 1, 1884. A cylindrical electrode is fixed to the diaphragm, and a pointed electrode is arranged at right angles to it in order that the vibrations of the diaphragm may cause a sliding contact between the electrodes. See illustration.

(1) 376,071. (2) 376,072. Electric Circuit Breakers; W. R. Cole, Detroit, Mich., Assignor to Parrish Bros. and the Peck Electrical Company, both of same place. Applications filed Aug. 3, 1887. These devices are operated in one direction by a spring and in the other manually. The circuits are controlled by sliding contacts located in a cylinder, and on a plunger which plays within the cylinder.

376,116. Lighting Cars by Electricity; A. D. Stevens, Minneapolis, Minn., Assignor of one-half to E. B. Dillingham, same place. Application filed June 10, 1887. An air compressor is driven from the axle of the car, and the compressed



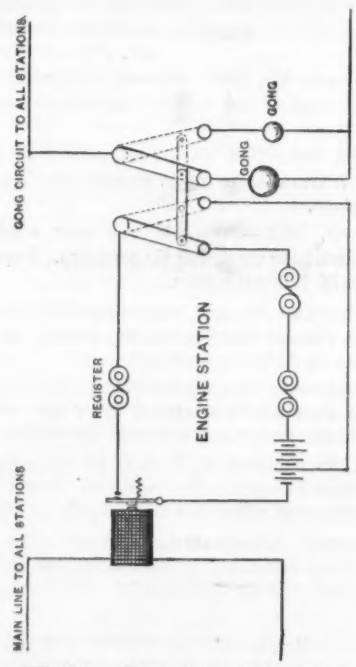
376,281. POLE INDICATOR FOR ELECTRIC CONDUCTORS.

air is used to run a dynamo which furnishes current for the lamps.

376,120. Dynamo or Motor; E. Thomson, Lynn, Mass. Application filed March 30, 1887. The field magnet coil is wound to produce saturation in its core, and a second set of coils is properly wound and applied to have a variable effect on the field in accordance with the variations in the work. The second coil sets up magnetism of a polarity that would tend, when work is diminished, to develop a counter electromotive force to that developed by coils which are acted upon by the pole of the saturated core. See illustration.

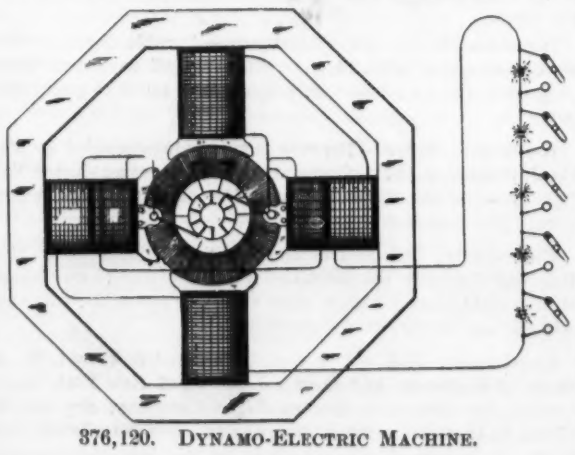
376,121. Electric Lock; C. A. Tucker, of Islip, New York, Assignor to The Tucker Electrical Manufacturing Company, New York. Application filed Feb. 4, 1887. This device is adapted to secure doors in position when open or closed and is operated in such manner that the catch may be released by electricity, so that when the door has been arranged in the desired position, the holding device can be operated from a distance to change the position automatically when free, and may be released to operate according to such disposition.

376,133. Fire Alarm Circuit; J. P. Barrett, Chicago, Ill. Application filed Nov. 16, 1886. A shunt circuit is arranged around the devices at the station which open the stall doors and awaken the men. At night the shunt is switched into circuit and when an alarm is sounded the watchman determines from the register whether the call is for that station. If so, the switches are turned and the current allowed to pass through the door openers, etc.; if not, the current is allowed to pass through the shunt. See illustration.



376,133. FIRE ALARM CIRCUIT.

376,149. Receiving, Transmitting and Distributing Instrument for Electro-Magnetic Thermoscopes; H. J. Haight, New York, N. Y. Application filed June 24, 1886. This instrument receives and exhibits the thermometric indica-



376,120. DYNAMO-ELECTRIC MACHINE.

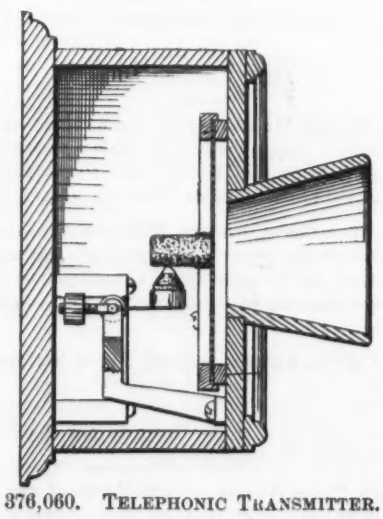
tions transmitted from distant observatories. It also transmits the indications through continued electric circuits to other observatories and through branch circuits to local stations, and so on, through as many circuits and branches as are required.

376,171. Annunciator; J. P. Tirrell, Somerville, Mass., Assignor to The Electric Gas Lighting Company, of Portland, Me. Application filed Feb. 28, 1887. The drop is provided with supporting pivoted arms which act in conjunction with a stop to release the armature should it be held against the magnet by residual magnetism.

376,228. Battery Zinc; John Beattie, Jr., Fall River, Mass., Assignor to The Beattie Battery Zinc and Electrical Company, same place. Application filed Aug. 13, 1887. For description see page 30, this issue.

376,281. Pole Indicator for Electric Purposes; A. Berghausen, Elberfeld, Germany, Assignor to E. Imhauser, of Brooklyn, N. Y. Application filed Sept. 22, 1887. The apparatus consists of a transparent chamber containing an oily liquid into which project platinum pins connected with each end of line. When the current passes the negative pole changes its color. See illustration.

376,307. Dynamo; F. Jehl, Paris, France, Assignor to the Société Anonyme Compagnie Continentale Edison, same place. Application filed Feb. 28, 1887. The disc armature is characterized by the coils grouped around a central spindle,



376,060. TELEPHONIC TRANSMITTER.

each coil being formed by means of a strip of copper slitted longitudinally, with its two parts spread apart and bent into polygonal form. See ELECTRICAL WORLD, July 2, 1887.

376,323. Electric Lamp; L. H. Leber, York, Pa., Assignor to J. G. Leber, same place. Application filed Aug. 4, 1887. A number of filaments of different lengths and curvature are arranged in the same plane in the globe, and their terminals are connected with two conducting strips, which are brought into circuit by the turning of the socket when the usual bayonet joint is coupled.

376,346. Armature for Dynamo; H. Lemp, Hartford, Assignor to the Schuyler Electric Company of Middletown, Ct. Application filed Sept. 7, 1886. The wires from each coil of the armature pass to an insulating ring, and thence are distributed in two groups, which pass through perforations in the shaft diametrically opposite each other to the hollow within the shaft. The groups are kept separate within the shaft by a plug.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.